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The Role of
Telephone Data Collection
in Federal Statistics

Prepared by
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Mail and Personal Interviews in Federal Statistics
Federal Committee on Statistical Methodology

Statistical Policy Office
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PREFACE

The Federal Committee on Statistical Methodology was organized by OMB in 1975 to identify and investigate methodological problems that affect the quality of federal statistical data. Members of the committee, selected by OMB on the basis of their recognized expertise, serve as individuals rather than as agency representatives. The committee carries out its work through subcommittees organized to study selected issues and open to any federal employee interested in participating. Working papers are prepared by the subcommittee members and do not necessarily represent the views of the Office of Management and Budget.

The Subcommittee on the Role of Telephone, Mail, and Personal Data Collection in Federal Statistics was formed to review the available methods of data collection. At an early meeting the Subcommittee decided that its primary focus would be the role of telephone data collection in Federal statistics.

This working paper discusses data collection methods in federal statistical surveys, gives illustrative uses of telephone interviewing, and describes research and development issues relating to telephone data collection. The report is intended primarily to be useful to Federal agencies in their data collection efforts. Seminars will be organized to discuss the report with interested agency personnel.

The Subcommittee was chaired by Robert D. Tortora, Statistical Reporting Service, Department of Agriculture.

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Many individuals contributed to this report. The work was initially guided by Robert Fuchsberg of the National Center for Health Statistics. Marvin Scherr of the Social Security Administration participated actively in the initial development of this subcommittee. Maria Gonzalez worked with the subcommittee throughout the development of the report. Charles Jones, Monroe Sirken and Zahava Doering, members of the Federal Committee on Statistical Methodology, supplied comments on the complete report. We are especially appreciative of the review and editing of the whole report done by Carol House.

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Chapter I SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

GENERAL SUMMARY

This report reviews the current and prospective status of telephone interviewing in Federal statistical surveys. In broad summary, it concludes that:

- Federal statistical data collection makes only limited use of the telephone interview, and that use is largely in combination with other methods, such as the mailed questionnaire and the personal interview. The telephone is not used extensively as the primary mode of data collection by any Federal agency. When employed as the sole data collection method, it is most commonly used in: one-time or occasional surveys; those with smaller than average sample sizes and reporting burden for respondents; and surveys which are contracted out.
- Very few statistical surveys conducted directly by Federal agencies utilize more recently developed telephone survey methods, such as random digit dialing (RDD) and computer-assisted telephone interviewing (CATI), which are widely used in the private sector. The Census Bureau and the Department of Agriculture's Statistical Reporting Service, have made major commitments to the development of such capabilities but have not yet reached the stage of implementation. These and other Federal agencies such as the National Center for Health Statistics, also have made important contributions to research and development of modern telephone methods and have taken the lead in the statistical theory of dual-frame personal-telephone survey designs. However, these contributions have not been adequately disseminated across the Federal structure.
- Modern telephone interview methods have the potential of making important contributions to Federal statistical data collection. These include: (a) reduction of total survey costs, especially where the telephone may replace personal visit interviewing; (b) increasing the timeliness of statistical reporting; (c) improving quality control of data collection operations; (d) improving response rates; and (e) reducing nonsampling errors.
- In view of the apparent under-utilization of telephone survey methods relative to their potential benefits, it is recommended that Federal agencies reassess their choices of data collection methods for statistical surveys. Where a change of data collection methods is indicated, plans to implement these changes should be initiated or accelerated.
- This reassessment should not be limited solely to considerations of cost and timeliness but also should give full consideration to the consequences of alternative data collection modes for population coverage, respondent cooperation and nonresponse biases, data quality, and maintenance of statistical series.

The remainder of this chapter presents conclusions and recommendations in more detail. The conclusions are arranged under three topics paralleling chapters of the report.

CONCLUSIONS

Data Collection Methods In Federal Statistical Surveys

The current use of telephone interviewing in Federal statistical surveys was assessed by analysis of records in the Reports Management System (RMS) of the Office of Management and Budget (OMB) and of additional information provided by three major agencies. (See Chapter III.)

The RMS contains a record for every OMB approved data collection from 10 or more respondents by a Federal agency or its contractor. A total of 2,137 records were identified which were active on the reference date of August 22, 1981 and which described a data collection undertaken for the purpose of: general purpose statistics, program evaluation, program planning or management, or research.

- Only 2 percent of the records listed telephone interviewing as the sole data collection method employed by the survey; and only 9 percent listed telephone interviewing used in association with other methods, such as with self-administered questionnaires (4 percent), personal interviews (2 percent) or both (3 percent).
- The most common method of Federal statistical data collection is by self-administered questionnaire (96 percent of these are "mailed" questionnaires), reported as the only method used in 69 percent of the records. The second most common single method is the personal interview, reported as the only method in 9 percent of the records. In total, about 19 percent of the surveys use personal interviews alone or in combination with other methods.
- While there is considerable variation among Federal Departments in the choice of data collection methods, none make extensive use of the telephone relative to other methods.
- As single methods of data collection, the telephone interview and personal interview are used disproportionately with the individual or household respondent. The telephone in combination with the mail is most likely to be used in surveys of business or industry or of farms.
- While about three-fourths of survey records listed a Federal agency as the data collection agent, two-thirds of surveys using telephone methods exclusively or in combination with personal interviewing were contracted out. This may reflect the fact that government agencies in 1981 had limited telephone data collection capabilities.
- The telephone interview, the personal interview, and combinations involving the personal interview were most common in one-time surveys, whereas the mail and mail-telephone combinations were used disproportionately often in periodic data collection efforts. This suggests that the telephone approach has not been built into scheduled ongoing data collection for most Federal agencies other than to follow-up mail nonrespondents.

A second analysis was performed on 113 surveys for which the Departments of Agriculture, Commerce, and Health and Human Services provided supplemental information. These additional results were obtained:

- Virtually all surveys using mail questionnaires during the initial wave of data collection use the telephone for non-response followup.
- The samples for personal interview surveys come primarily from a probability area frame. Surveys using mail questionnaires are based on list frames, as were 50 percent of the surveys conducted primarily by telephone. Only 25 percent of these telephone surveys used random digit dialing.
- Personal interview surveys are larger. They are used to contact more respondents, obtain more responses, and impose more response hours than other types of survey.

Illustrative Uses Of Telephone Interviewing

The telephone interview plays a variety of roles in Federal data collection. The following is a listing of primary uses illustrated by the case studies in Chapter IV.

Nonresponse follow-up to mailed questionnaire. This is the most common way in which telephone interviews are currently employed in Federal data collection. Telephone interviews are used to obtain data from sample units not replying to mailed forms to increase the response rate or to estimate nonresponse biases. Among Federal surveys using mailed questionnaire, only about one in ten reported telephone usage in their OMB clearance forms. However, additional information from three agencies suggest very extensive use. Case studies: the Census of Agriculture; Hog and Cattle Inventory Surveys; Advance Retail Trade Survey.

Subsequent contacts after an initial contact in person. This method uses a personal interview to establish initial contacts (especially with households) and to obtain telephone numbers. Succeeding interviews with additional household members or for later waves of data collection are completed by telephone for households with telephones and by personal interview for those without. For large surveys, this method substantially reduces data collection costs compared with exclusive reliance on personal interviewing. Case studies: the Current Population Survey; the Quarterly Household Survey.

Initial contact from a list sample. In this data collection procedure, lists of specialized populations are the source of samples contacted by telephone. The procedures are efficient when good lists are obtained. Case studies: Nonresidential Buildings Energy Consumption Survey; Household Transportation Survey; Long-Term Care Survey; Mobile Home Placement Survey.

Initial contact using random digit dialing (RDD). In this method, households are sampled directly through the population of telephone numbers, thus eliminating the high costs of sampling, travel, and interviewer time for personal interviewing. Random digit dialing circumvents the well known limitations of telephone directory sampling, especially the omission of unlisted numbers. Case studies: Survey of Consumer Attitudes; Health Interview Survey Random Digit Dialing Study.

Research and Development Issues

Use of the telephone interview for Federal data collection raises a broad set of issues ranging from population coverage and data quality to relative survey costs and the timeliness of data collection and processing. While definitive generalizations applicable across the full range of potential uses of telephone interviewing are rarely available, accumulating evidence continues to suggest the appropriateness of telephone interviewing for many types of Federal data collection.

A brief summary of research evidence on telephone interviewing follows, but it should be recognized that in most cases the answer depends on the individual survey application. A summary of research findings by others cannot substitute for adequate pilot testing for individual surveys.

Costs. The development of cost models for telephone surveys is in its early stages. More accurate cost data need to be collected. Effects involving the total survey design such as administrative structure, nonsampling errors, expected response rates, economies of scale, and robustness of cost data need to be included in the models. Overhead cost, in particular, are changing with the increased use of centralized telephone facilities and the introduction of CATI.

Response Rates. Achieving adequate response rates for telephone surveys is a major concern of federal agencies. They vary considerably between different organizations and different surveys in the same organizations. Even the methods of computing response rates differ. Organizations should publish the specific formula they use. Research should continue to identify variables that can predict response in a variety of populations.

Coverage. Certain populations are more easily reached by telephone than others. Recent studies characterizing telephone households make it easier to identify appropriate ones ahead of time. The development of random digit dialing (RDD) and dual frame methodologies have greatly reduced coverage problems. However, more research is needed especially in the area of rare or specialized populations.

Interviewer Medium Bias. One should not expect to find massive differences between data collected via telephone and personal interviews in equally well designed surveys. The importance of the differences that may appear will depend on the subject matter of the survey and the level of accuracy needed. Careful pilot testing is advisable before changing collection methods on a continuing data series.

Computer-Assisted Telephone Interviewing (CATI). CATI, along with RDD, represent the major thrusts in telephone interviewing. It has the potential to greatly enhance the quality of telephone data collection. However, CATI's limitations and greatest strengths are derived from the same source—control of the data collection procedures. Several methodological studies are now being conducted by the Census Bureau and the Statistical Reporting Service to measure the impact on the organizations and the data they collect. CATI may be most advantageous when used for large repetitive surveys. However, experience in the private sector suggests many appropriate situations.

Dual Frames. Dual frame methodology minimizes coverage problems while maintaining design efficiency. The addition of several modes of interviewing, most notably random digit dialing, in combination with dual frames has allowed telephone interviewing to be used in innovative new designs. Current researchers are exploring the problems of nonsampling errors and optimum allocation between frames.

RECOMMENDATIONS

Federal agencies should reassess their choices of data collection methods for statistical surveys in view of recent advances in telephone survey methodology and the varying roles telephone interviews may play in reducing survey costs and increasing the timeliness of statistical reporting.

- In agencies where this reassessment process has begun, it should be accelerated to ensure that the most cost-efficient and effective data collection methods are adopted within time frames permitting the maintenance of statistical series.
- In agencies where such a reassessment has not begun, it should become a high priority task incorporated into formal planning processes.

This reassessment should not be based solely on cost considerations and timeliness but also should give full consideration to the consequences of alternative data collection methods for population coverage, respondent cooperation and nonresponse biases, interviewer contributions to variance, and other factors affecting data quality and total survey error. This report and research studies now in progress at several agencies should provide guidance in making this reassessment.

Where a change of data collection is indicated for continuing statistical series, appropriate phase-in procedures should be adopted to ensure the continuity of estimates or to permit the appropriate splicing of estimates across the transition. Typically this requires conducting the survey by both methods for an appropriate period.

Agencies controlling and approving budgets for statistical surveys should recognize that changes of data collection methods to accomplish cost savings generally will require a temporary budgetary increase during the transition phase. Similarly, adoption of advanced technologies such as computer-assisted telephone interviewing, will generally require initial investments in hardware, software, and training to be amortized over long periods. These agencies should also recognize that changes in data collection modes which are designed to upgrade data quality, timeliness, and survey efficiency will require commensurate additional funding to accomplish these objectives.

Appropriate organizational structures should be established to permit a sharing of information across Federal agencies engaged in reassessment of their data collection methods for statistical surveys, thereby reducing the number of staff members required of each agency for this process. This organizational arrangement should permit more frequent interchanges of information than is possible through the annual meetings of professional associations.

Chapter II INTRODUCTION

BACKGROUND

The Subcommittee on the Role of Telephone, Mail and Personal Interviews was established by the Federal Committee on Statistical Methodology in January 1981. The Committee assigned the Subcommittee with reviewing alternative data collection methodologies in the federal government. The Subcommittee determined that the scope of the assignment was beyond the magnitude of any single group, and focused on the use of the telephone in Federal data collection.

This report provides an overview of the use of telephone as a primary and auxiliary mode of data collection and discusses factors which determine if telephone interviewing is appropriate for a federal statistical organization. Because the uses of large scale telephone interviewing is a new concept within the federal government, there is particular emphasis on the variations of use and the initial work that must be undertaken prior to implementing large scale data collections within any agency.

AUDIENCE

The report is geared to several types of users within the federal government. It is primarily aimed at the statistical community to provide an overview of the uses of the telephone in a wide range of data collection activities. For agency policymakers, it is designed to indicate the multiplicity of issues involved in considering the use of the telephone as a collection mechanism. The report implicitly describes the complexity of these issues and attempts to assist with some preliminary cost guidelines. Individual project managers will find assistance in implementing new surveys or changes to existing ones by reviewing case studies that examine similar populations or problems.

Although the report is geared specifically to federal data collection agencies, it should also be of interest to a broad range of data collection groups.

ORGANIZATION OF THE REPORT

The report is composed of three additional chapters and an annotated bibliography. Chapter III is an assessment of the frequency and variation of use of the telephone in federal surveys. This information is obtained from a review of 2,137 surveys where the use of the telephone was indicated on the OMB Standard Form-83 (SF-83). The chapter then concentrates on the statistical data collection experiences of three departments--Health and Human Services, Commerce and Agriculture. Chapter IV presents specific case studies of federal surveys that use the telephone, emphasizing the four major use areas: nonresponse followup, subsequent contacts after an initial contact, initial contact from a list sample, and initial contact using random digit dialing. Chapter V concentrates on the major research and development work underway in the statistical community with respect to: costs; response rates; coverage; interview medium bias; interviewer monitoring, training and evaluation; computer assisted telephone interview; and dual frame surveys.

Chapter III DATA COLLECTION METHODS IN FEDERAL STATISTICAL SURVEYS

INTRODUCTION

This chapter assesses the use of different data collection methods by Federal agencies in 1981 and 1982. The assessment includes collection methods by sponsoring agency, type of respondent, collection agency, frequency of data collection, and several measures of respondent burden.

The review finds that while there is some use of the telephone interview, that use is limited and is largely in combination with other methods. The telephone is not used extensively as the primary mode of data collection by any Federal agency. In combination with a mail questionnaire, the telephone is used to collect information from nonrespondents or to encourage the return of the questionnaire. The telephone in combination with the personal interview is most commonly used in one-time surveys of individuals with relatively large sample sizes.

SOURCES OF DATA

The descriptive information in this chapter is based on the Reports Management System (RMS) maintained by the Office of Management and Budget (OMB), and on additional information provided by three major agencies. The RMS is a computer data file constructed from the OMB Standard Form 83. OMB requires every agency to submit this form for approval whenever the agency or its contractor collect information from 10 or more respondents. If OMB approves the request, they enter information from the SF-83 into the Reports Management System and that record remains active until the OMB assigned expiration date. This analysis examines records active on August 22, 1981.

The reported purpose of the data collection (on the SF-83) was used to identify statistical surveys within this larger set. The Subcommittee decided that two of the six categories of purpose--application for benefits, and regulatory or compliance--were out-of-scope for this analysis ^{1/}. Records in any of the remaining four categories--program evaluation, general purpose statistics, program planning or management, and research--were included. The 2,137 records meeting this criterion (40 percent of the total file) are called "survey records" in the text and tables which follow.

The three agencies with the largest number of data collections--the Departments of Agriculture, Commerce, and Health and Human Services--provided the Subcommittee with more detail about 113 surveys with a telephone component. Additional analysis was performed on this subset, and it is presented after the results from the full set of survey records.

^{1/} Since multiple purposes can be indicated, the excluded categories can appear in combination with the in-scope categories. Entries with both in-scope and out-of-scope purposes were retained and may include records of marginal relevance.

Table 1 provides a distribution of the survey records by data collection method as coded on the SF-83. 1/ Two-thirds gave the self-administered questionnaire 2/ as the only method of data collection. The personal interview and the telephone interview are reported as the sole method of data collection for ten percent and two percent respectively. About one-seventh of the records are coded as involving multiple data collection methods. These include the telephone in combination with the self-administered questionnaire (four percent), the personal interview (two percent), and both (three percent). Thus a total of about 11 percent involve the telephone interview.

Table 1: Reported data collection method of active OMB approved surveys, August 22, 1981.

Number	Percent	Data Collection Method
1,470	68.8	Self-administered only
46	2.2	Telephone interview only
201	9.4	Personal interview only
90	4.2	Personal interview and self-administered
88	4.1	Telephone and self-administered
36	1.7	Telephone and personal interview
62	2.9	Personal interview, self-administered and telephone
144	6.7	All other*
2,137	100.0	Total

* Includes 111 records with data collection method not given.

LIMITATIONS OF DATA

Some observations are appropriate to interpret the findings presented above and in the section which follows:

- The specific content of the SF-83 changed several times in the several years preceeding the base year used in this study. The file analyzed contained entries from three different forms. Consequently, there are missing data on some variables (Federal cost for example) and undoubtedly inconsistencies on others. The SF-83 has changed since 1981 and the present version does not identify "Data Collection Method".

1/ Because it was not possible to tabulate directly from the OMB file, selected data were abstracted from the appropriate entries, coded, and a data file created. The tabulations in this report were generated from that file. The Subcommittee is indebted to the Computer Systems and Programming Branch, Division of Health Interview Statistics, NCHS, for the file creation and data processing.

2/ The category "self-administered" includes 1,415 records coded as "mail self-administered" and 55 records coded as "other self-administered."

- The choice of telephone interview as one of the explicit data collection methods which could be checked was not available on the SF-83 until September 1980. Prior to that time the category "other" had to be checked and the words "telephone interview" written in. The effect of these omissions, if any, is to underrepresent the use of the telephone method.
- How extensively the telephone is used for data collection varies greatly. For example, the telephone may represent the only method of data collection as in random digit dialed (RDD) surveys or it may be used only to obtain data from those not responding to a mail questionnaire. Further, the telephone may be used for purposes other than actual data collection, such as to contact a respondent to arrange for a personal interview, to verify or supplement information collected by mail or personal interview, or to encourage the respondent to return a mail questionnaire. It was not possible in the analysis based on the RMS to determine how frequently such auxiliary uses of the telephone are included in reported uses of the telephone as a data collection method.
- Many surveys listed in the RMS involve several stages of data collection; e.g., longitudinal, pretest and survey, core questionnaire and supplements. Sometimes one survey record appears in the RMS covering all stages and other times a separate record appears for each stage. Thus, each entry does not necessarily represent a distinct data collection effort.
- There is considerable variation in the characteristics of the surveys, which makes generalizations as to a "typical" Federal statistical survey difficult. For example, number of respondents can be more than one hundred thousand or as little as ten; estimated cost can be in the millions of dollars or only a few thousand; the number of responses per respondent varies from 1 to 52; and so on.

FINDINGS

Full Survey Record File

Cross tabulations of data collection method by selected variables are presented in Tables 2-6. 1/ Table 2 provides a distribution by collection method for selected sponsoring Departments or agencies. The Departments with the largest numbers of survey records are Health and Human Services (326), Commerce (316), Agriculture (257), Energy (132), Defense (111), Labor (106), and Housing and Urban Development (105).

1/ Tables appear at the end of the chapter.

While there is considerable variation among Departments, the self-administered questionnaire is the most common approach for each. The Departments with the largest numbers of personal interview surveys are HHS (48) and Agriculture (31). None of the Departments make extensive use of the telephone relative to other methods. The telephone in combination with the mail or personal interview is used in 33 percent of the surveys of the Department of Agriculture.

Table 3 provides data on type of respondent. One half of the entries involve data collection from business or industry and about one-fifth each from individuals (or households) and State or local government. As single methods of data collection, the personal interview and the telephone interview are used very frequently with the individual or household respondent. The telephone in combination with the mail is most likely to be used in surveys of business, industry or farms; in combination with the personal interview for individuals or households.

A distribution by collection agent--either the Federal Government or a contractor--is given in Table 4. Three fourths of the records list a Federal agency as the data collection agent. Those involving the self-administered approach, either as a single method or in combination with the personal interview or telephone, were mostly conducted by a Federal agency. By contrast, almost two-thirds each of the telephone and the telephone-personal interview combination were contracted out to a non-federal agency. This may reflect the fact that government agencies currently have limited telephone data collection capabilities.

Information from other sources suggests that in combination with the mail, the most common use of the telephone is either to encourage nonrespondents to return mail questionnaires or to provide the information over the telephone. This use generally requires a smaller staff and a less sophisticated system than telephone data collection alone or in combination with the personal interview. Thus, the high proportion of telephone-mail surveys which are conducted by Federal agencies is not surprising.

Table 5 provides data on frequency of data collection. About one half the surveys were infrequent (either single or occasional) and one-half periodic (weekly-biennial). The telephone interview, the personal interview and combinations involving the personal interview were most common with one-time surveys whereas the mail and the mail-telephone combination were used disproportionately in periodic data collection efforts. These data suggest that the telephone approach has not been built into scheduled ongoing data collection for most Federal agencies other than to follow-up mail nonrespondents.

Estimated median values for selected measures of sample size and respondent reporting burden are provided in Table 6. These are approximate values and for each measure there is a wide range of values within each collection method. Across all methods the median number of respondents and total responses (number of respondents X number of responses per respondent) are around 550 and 1,400, respectively. The self-administered survey, the telephone survey, and the two in combination have the lowest median values on these measures. The telephone and the telephone self-administered combination also have lower than average median values for two respondent burden measures--total hours reporting burden and minutes per response.

Costs are not compared here. The RMS file contained values for "Federal cost" in only one-third of the records. The cost relationships in the other two-thirds may be considerably different. Data which are available does not represent pure estimates of cost by data collection method because many factors with the potential to affect cost substantially are unknown. There is no reason to assume consistency among agencies in deriving estimates of Federal cost.

Selected Surveys from the Department of Agriculture, Commerce, and Health and Human Services

As a result of the limitations discussed earlier in this chapter the Subcommittee moved to obtain additional data from the three agencies with the most reported surveys in the RMS--the Departments of Health and Human Services, Commerce and Agriculture. Together they accounted for 899 or 42 percent of the 2,137 active surveys (Table 2). The remainder of this chapter describes the findings from 113 surveys for which the three Departments provided more information. These 113 surveys were taken primarily from the original RMS file, but some additional surveys were included that were active on August 22, 1981, but were missing from the RMS. All of these surveys used the telephone in some way for data collection. These surveys included "self-administered" surveys that were mailed. Therefore the term "self-administered" will be replaced in this discussion by the more common term, "mail."

Table 7 cross-classifies the "primary means" of data collection by the mix of data collection methods used in the initial wave of the survey. Twenty surveys used the telephone as the primary mode of data collection. In most of these it was the exclusive mode. For 3 of the 17 personal interview surveys, agencies permitted a telephone substitute when convenient or cost effective. All but 2 of the 76 mail or mail/telephone/personal interview surveys used the telephone for nonresponse followup on their initial waves of data collection. Overall, 16 of the 113 surveys do not use the telephone to collect data.

Table 8 provides the frequency of respondent contacts. It shows telephone surveys are distinctive in having only one contact with the respondent. In the other three categories, 80 percent or more of the surveys have more than one contact. Table 9 shows the frequency or periodicity of the survey. It indicates that telephone surveys tend to be one-time surveys and that no other category of survey shares that characteristic to the same extent.

Table 10 describes the sources of the samples by primary mode of data collection. Area probability samples are the domain of personal interview surveys. The mail and mail/telephone/personal interview surveys use list samples. Random digit dialing is the source of the sample for only 25 percent of the telephone surveys.

Tables 11, 12, and 13 provide three measures of the sizes of the surveys: number of respondents, number of responses, and number of respondent hours. They describe the characteristics of surveys categorized by the primary means of data collection. Personal interview surveys, by far, have the largest (median) number of respondents, responses and response hours. The medians for personal interview surveys are about five times larger than the medians for the next largest data collection type. The mail/telephone/personal interview survey has the second largest medians. The medians are similar for the "telephone" and "mail" surveys.

Table 2: Percentage distribution of reported data collection method of active OMB approved survey records by sponsoring Federal Department or Agency, August 22, 1981.

Department or Agency	Data Collection Method								Total	N
	Self-Adm Only	Tel-Int Only	Pers Int Only	Pers Int S-Adm	Tel Int S-Adm	Tel Int		All Other		
						Tel Int Pers Int	Pers Int S-Adm			
Health & Human Services	64%	3	15	5	2	2	3	6	100%	326
Commerce	78%	1	5	1	4	2	2	7	100%	316
Agriculture	40%	1	12	7	18	2	13	7	100%	257
Energy	73%	4	11	4	2	-	1	5	100%	132
Defense	76%	4	10	-	-	-	-	10	100%	111
Labor	45%	1	18	7	2	5	7	15	100%	106
Housing & Urban Development	74%	2	12	1	1	1	-	9	100%	105
Education	86%	-	2	5	1	-	1	1	100%	84
Treasury	95%	-	2	2	-	1	-	-	100%	63
Interior	84%	-	7	4	-	-	-	5	100%	57
Transportation	64%	7	7	4	-	-	-	18	100%	56
Justice	68%	5	7	-	5	2	-	13	100%	44
Veterans Administration	92%	-	2	4	-	2	-	-	100%	52
Environmental Protection A.	53%	13	20	-	-	7	-	7	100%	45
Railroad Retirement Board	77%	2	9	9	2	-	1	-	100%	47
Tennessee Valley Authority	43%	-	11	7	-	-	4	35	100%	28
All Others	78%	1	5	6	5	1	1	3	100%	308
Total	69%	2	9	4	4	2	3	7	100%	2137
N	(1470)	(46)	(201)	(90)	(88)	(36)	(62)	(144)		

Table 3: Percentage distribution of respondent type of active OMB approved survey records by reported data collection method, August 22, 1981.

Respondent Type	Data Collection Method								Total	N
	Self-Adm Only	Tel Int Only	Pers Int Only	Pers Int S-Adm	Tel Int S-Adm	Tel Int		All Other		
						Tel Int Pers Int	Pers Int S-Adm			
Individual/Household	14%	46%	50%	39%	12%	67%	10%	21%	20%	(425)
State/Local Government	21	11	9	2	7	6	5	32	18	(395)
Farms	1	2	10	6	23	6	31	3	4	(84)
Business/Industry	57	35	22	46	49	14	32	38	50	(1064)
Multiple	7	6	9	7	9	7	22	6	8	(169)
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	
N	1470	46	201	90	88	36	62	144	2137	

Table 4: Percentage distribution of collection agent of active OMB approved survey records by reported data collection method, August 22, 1981.

Collection Agent	Data Collection Method								Total	N
	Self-Adm Only	Tel Int Only	Pers Int Only	Pers Int S-Adm	Tel Int S-Adm	Tel Int		All Other		
						Tel Int Pers Int	Pers Int S-Adm			
Federal Government	81%	33%	53%	67%	86%	39%	73%	73%	75%	(1610)
Private Contractor	19	67	47	33	14	61	27	27	25	(527)
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	
N	1470	46	201	90	88	36	62	144	2137	

Table 5: Percentage distribution of frequency of data collection of active OMB approved survey records by reported data collection method, August 22, 1981.

Frequency	Data Collection Method								Total	N
	Self-Adm Only	Tel Int Only	Pers Int Only	Pers Int S-Adm	Tel Int S-Adm	Tel Int		All Other		
						Tel Int Pers Int	Pers Int S-Adm			
Single or occasional	38%	66%	63%	65%	34%	72%	45%	46%	44%	(938)
Weekly-semiannual	27	17	9	12	25	8	23	26	24	(514)
Annual or biennial	31	6	18	16	26	11	13	22	27	(582)
Other	4	11	10	7	15	9	19	6	5	(103)
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	
N	1470	46	201	90	88	36	62	144	2137	

Table 6: Estimated median values for selected measures of sample size and respondent reporting burden of active OMB approved survey records by reported data collection method, August 22, 1981.

Selected Measures	Data Collection Method								Total
	Self-Adm Only	Tel Int Only	Pers Int Only	Pers Int S-Adm	Tel Int S-Adm	Tel Int		All Other	
						Tel Int Pers Int	Pers Int S-Adm		
Number of respondents	400	1000	1500	3500	800	4300	2600	800	550
Number of responses	1100	1300	2000	4700	1600	4700	7600	2000	1400
Hours of reporting burden	1200	500	1000	3300	600	1800	1800	1800	1200
Minutes per response	45	20	30	20	15	30	15	35	30
Total number records	1470	46	201	90	88	36	62	144	2137

Table 7: Mode of initial wave of data collection by primary mode of data collection., three departments,
August 22, 1981.

Mode of Initial Wave	<u>Primary mode of data collection</u>				Total	N
	Telephone	Personal interview	Mail	Mail telephone and personal interview		
Telephone interview only	90%	0	0	0	16%	(18)
Personal interview only	0%	82	0	0	12%	(14)
Mail questionnaire only	0%	0	5	0	2%	(2)
Primarily personal interview; telephone interviews permitted when convenient, needed or cost-effective	0%	18	0	0	3%	(3)
Primarily telephone interview; personal interview for units without telephones or for other special reasons	10%	0	0	0	2%	(2)
Mail tried first with telephone followup for those not responding by mail	0%	0	95	0	36%	(41)
Mail tried first; telephone tried next for those not responding by mail; personal interview tried last for those unreachable by phone or for especially large or significant reporting units	0%	0	0	100	29%	(33)
Total	100%	100%	100%	100%	100%	(113)
N	20	17	43	33	113	

Table 3: Frequency of respondent contact by primary means of data collection, three departments, August 22, 1981.

Frequency of Contact	<u>Primary mode of data collection</u>				Total	N
	Telephone	Personal interview	Mail	Mail telephone and personal interview		
One contact	65%	6%	16%	3%	19%	(21)
Multiple contacts	20	88	81	91	74%	(84)
Unknown	15	6	3	6	7%	(8)
Total	100%	100%	100%	100%	100%	(113)
Number	20	17	43	33	113	

Table 9: Frequency of survey by primary means of data collection, three departments, August 22, 1981.

Frequency of survey	<u>Primary mode of data collection</u>				Total	N
	Telephone	Personal interview	Mail	Mail telephone and personal interview		
One-time	80%	24%	9%	9%	24%	(27)
Continuing, periodic	5	29	26	33	25%	(28)
All other frequencies	15	47	65	58	51%	(58)
Total	100%	100%	100%	100%	100%	(113)
N	20	17	43	33	113	

Table 10: Sources of samples by primary means of data collection, three departments, August 22, 1981.

Source	Telephone	Personal interview	Primary mode of data collection		Total	N
			Mail	Mail telephone and personal interview		
Area probability sample	5%	76%	0%	0%	13%	(15)
List samples	50	6	95	85	71	(80)
Both of the above	0	18	5	15	8	(9)
Random digit dialing	25	0	0	0	4	(5)
Other	20	0	0	0	3	(4)
Total	100%	100%	100%	100%	100%	(113)
Number	20	17	43	33	113	
<u>Duplicated</u>						
Area probability sample	5%	94%	5%	15%	20%	
List samples	50	24	100	100	80%	
Random digit dialing	25	0	0	0	4%	
Other	20	0	0	0	4%	
Total	100%	*	*	*	*	

*Totals to more than 100% because some data collections used more than one source for the sample.

Table 11: Number of respondents by primary means of data collection, three departments, August 22, 1981.

Number of respondents	<u>Primary mode of data collection</u>				Total	N
	Telephone	Personal interview	Mail	Mail telephone and personal interview		
50,000 or more	0%	35%	9%	9%	12%	(14)
10,000 - 49,999	10	35	19	18	19	(21)
1,000 - 9,999	55	24	26	46	36	(41)
100 - 999	30	6	32	18	24	(27)
Less than 100	5	0	14	9	9	(10)
Total	100%	100%	100%	100%	100%	113
N	20	17	43	33	113	
Median	2,092	12,270	1,083	2,457	5,290	

Table 12: Number of responses by primary means of data collection, three departments, August 1981.

Number of responses	<u>Primary mode of data collection</u>				Total	N
	Telephone	Personal interview	Mail	Mail telephone and personal interview		
50,000 or more	0%	47%	12%	24%	19%	(21)
10,000 - 49,999	20	35	28	21	26	(29)
1,000 - 9,999	50	12	25	30	29	(33)
Less than 1,000	30	6	35	25	26	(30)
Total	100%	100%	99%	100%	100%	(113)
N	20	17	43	3	113	
Median Number of Responses	2,436	42,673	2,600	7,500	8,327	

Table 13: Number of respondent hours by primary mode of data collection, three departments, August 1981.

Respondent Hours	<u>Primary mode of data collection</u>				Total	N
	Telephone	Personal interview	Mail	Mail telephone and personal interview		
10,000 or more	0%	47%	12%	18%	17%	(19)
1,000 - 9,999	40	41	35	39	38	(43)
Less than 1,000	60	12	53	43	45	(51)
Total	100%	100%	100%	100%	100%	(113)
Number	20	17	43	33	113	
Median	887	6,300	670	1,320	2,406	

Chapter IV ILLUSTRATIVE USES OF TELEPHONE INTERVIEWING

INTRODUCTION

This chapter provides examples of major ways Federal agencies use the telephone to collect data. They are:

- Nonresponse followup
- Subsequent contacts after an initial contact in person
- Initial contact from a list sample
- Initial contact using random digit dialing.

The case studies show how these data gathering techniques are used in Federal surveys. They also illustrate unique configurations of survey populations, various problems, and attempts to resolve those problems. The Subcommittee hopes the information will encourage prospective users to consider thoughtfully the advantages and disadvantages of telephone technology, and will provide current users with new insights.

The telephone facilitates additional tasks, not discussed below, which make up a smaller part of a given data collection. It is, however, the use of the telephone that makes many of these tasks possible and minimizes the effort needed to complete them. They include:

- Scheduling appointments for personal interview
- Prompting respondents to return mail questionnaires; answering inquiries about the questions on the form
- Classifying or completing information
- Reinterviewing for quality control.

NONRESPONSE FOLLOW-UP

Case Study 1—The Census of Agriculture

Purpose and Description. The Census of Agriculture is taken every five years and provides economic and some demographic data for the agriculture industry at the county, state, and national level. The first agriculture census was taken in 1840. The 1982 Census of Agriculture was the 22nd nationwide agriculture census conducted in the United States.

Prior to 1969, the Census of Agriculture was based on a nationwide canvas of rural areas and personal interview by enumerators. The censuses since then have used a mailout/mailback self-enumeration procedure to collect data, with a portion of the nonrespondents contacted by telephone.

Sample Design. The list frame for the 1982 Census of Agriculture was composed of a list of likely farm operator names assembled from the 1978 census farm list and from records obtained from the Internal Revenue Service, the U.S. Department of Agriculture, other government agencies and agriculture related organizations. The major objective in developing this list was to provide as complete coverage as possible for all agriculture operations. The total number of records from all sources was about 19.0 million. A record linkage and screening operation to remove duplicate and nonfarm names reduced the final list to approximately 3.6 million names and addresses. Questionnaires were mailed to all addresses on this final list. Addresses not responding to the mail questionnaires were scheduled for telephone follow up, based on the size of their operations. Due to the significance of the larger farms, all of those nonrespondents were followed up to provide reliable data, specifically at the county level. Smaller operation nonrespondents were followed up on a sample basis.

Field Methods.

Mail Follow-up. The initial mailing of report forms was made in late December 1982; nonrespondents were sent a series of five follow up requests. In late February 1983, the first follow-up letter was sent to all nonrespondents reminding them of the February 15 due date. The other reminders, sent to nonrespondents, followed on a flow basis at 3- to 4- week intervals starting in March and continuing into July.

Telephone Follow-up. Operators whose annual sales were estimated to be \$100,000 or more were scheduled for follow-up if the returned forms were incomplete or inconsistent, or if they failed to respond to any of the mailings. This follow-up was done primarily by telephone interviewing.

The telephone follow-up operation was centrally operated from the Census Bureau's processing office in Jeffersonville, Indiana. The telephone unit received approximately 140,000 cases to call; of these, about 100,000 or 71 percent were nonrespondents with large farm operations.

Telephone interviews were conducted with the farm operators or with a knowledgeable household member if the operator was not available. The length of the interviews varied from a few minutes to as much as an hour, depending upon the type and size of operation and upon the availability of the information. The average length of interview was approximately 30 minutes.

If there was no answer on the first attempt to call a number, three more attempts were made. After four attempts the telephone number was verified to assure that it was the correct number. Information about farm operators who could not be contacted by telephone was obtained by calling local county agriculture offices.

The final number of nonrespondents after all mail and telephone follow-ups was approximately 0.5 million or 15 percent of the total list. Nonrespondents representing smaller farms were not followed up due to excessive cost and are represented in the census totals by a statistical adjustment based upon estimates from a sample of nonrespondents.

An additional part of the telephone follow-up operation for the 1982 Agriculture Census was implemented as a Computer Assisted Telephone Interviewing (CATI) test. A sample of about 9,000 large nonrespondent records was selected for completion using CATI at the Washington, D.C. office. An identical control sample in the central processing operation was flagged for comparison and analysis. The test is currently completed but comparisons to the regular follow-up group and other analyses have not been completed.

Consequences of the Use of the Telephone. During the 1982 Census of Agriculture, the telephone unit in the central processing office handled about 160,000 cases (incoming and outgoing). The major portion of these calls was to large farm nonrespondents. The telephone follow-up of this group resulted in about 60 percent completed reports directly from respondents, and 40 percent completed from secondary sources. The major benefits of the telephone follow-up were the reduction in data collection costs (estimated to be about one-fourth the cost of a personal visit interview), and the relatively high rate of success in the follow-up effort compared to follow up by mail only.

Disadvantages associated with using the telephone in the follow-up included the inability to reach households with unlisted telephone numbers and the refusal of some individuals or organizations to be interviewed by telephone which resulted in use of less reliable secondary source information.

Major Problem Areas, Issues. No conclusive data regarding the reasons for nonresponse or the characteristics of nonrespondents to the census now exist. However, a small study conducted during the follow-up of the 1982 Farm and Ranch Identification Survey has suggested some hypotheses. These results indicated that one major reason for the 15 percent nonresponse rate in that survey was that some people did not view themselves as farm operators. This occurred primarily among smaller, part-time operators who often had nonfarm jobs. Another factor affecting participation in the survey was privacy, i.e., some individuals considered their operation to be none of the government's business. Characteristics of nonrespondents and factors associated with motivation to respond need to be investigated more comprehensively to guide the development of improved follow-up procedures in future agriculture censuses.

Additional issues requiring examination include the use of CATI for the census follow-up, the optimum cutoff level for telephone follow-up and methods/alternatives for improving the reliability of data for the no contact telephone follow-up cases.

Case Study 2—Hog and Cattle Inventory Surveys

Purpose and Description. The Department of Agriculture (USDA) has published annual estimates of livestock inventories since 1866. Today this information is collected through several series of surveys conducted by the USDA's Statistical Reporting Service (SRS). Although hog and cattle inventory data are collected separately, the survey design and data collection procedures of these two series are similar, and they will be discussed here as a single case study. The major purpose of these two surveys is to collect and publish data on current hog and cattle inventories. These reports are issued twice a year for cattle and four times a year for hogs. Market animal numbers are collected and published by weight groups for use in slaughter forecasts. Data are also collected and published on breeding stock and breeding intentions.

Sample Design. SRS implemented a dual frame design for these surveys in the early seventies. An area frame, stratified by land use, is used to estimate for the incompleteness of a list of livestock operators stratified by the size of the livestock operation. A modified panel rotation scheme is followed in each series which allows multiple contacts with a core sample of respondents throughout the year and a systematic rotation of selected respondents to reduce burden. For cost efficiencies, the design also allows one data collection effort per year with full list sample size for each series, and one additional survey per year for cattle and three additional surveys for hogs with reduced samples. The following give a few of the highlights:

- A cattle survey with a full list sample and a subsample of the area sample is conducted in winter for state and national estimates, with an approximate national sample size of 47,000.
- A full area sample and a subsample of larger list strata is recontacted in summer to provide national cattle estimates only.
- A full dual frame hog survey is conducted each summer in the ten major producing states along with a subsample in the remaining states to provide national estimates.
- A dual frame sample is contacted in the winter to provide national and state estimates of hog inventories.
- A dual frame subsample in ten major hog producing states is recontacted in fall and spring quarters, with approximate national sample size of 20,000.

Field Methods. SRS uses a distributed system for data collection in which 44 state statistical offices work in conjunction with the main office in Washington, D.C. The Washington office designs the specifications for the survey and questionnaires, controls the computerized edit programs and summary systems, and provides training and direction to the state offices. The field offices are responsible for the actual data collection activities, including the hiring and training of interviewers, survey management, and editing.

The data are collected through a variety of modes. For the list samples, there is an initial mailout of questionnaires with telephone follow-up for nonresponse starting in approximately 5 days. Telephoning generally lasts for another 5 to 7 days. Larger operations are frequently contacted in person during the survey period to ensure maximum response in the larger strata. A portion of the telephone inaccessible are also contacted in person. Area frame samples are initially contacted in person. However, during subsequent survey periods that year, the area sample units (from which phone number and mailing addresses have been obtained on the initial visit) are handled the same as those in the list sample.

The cattle and hog inventory questionnaires generally take about 10 minutes to complete.

Consequences of the Use of the Telephone. The survey design has been basically unchanged since the early seventies. However, the emphasis in data collection has gradually shifted from mail to telephone returns. For example, in March 1978 the telephone accounted for 56%, mail--28%, and personal interview--16%. Three years later, in December 1981, these percentages had changed: telephone--65%, mail--19%, and personal interviewing--16%. These shifts were caused by reduction in mail response rates, requiring more telephone contacts. The percent of total returns by personal interview remained constant.

SRS has traditionally concentrated the majority of its efforts and expertise on data collection by mail and personal interviewing. However, the trends discussed above in the livestock surveys (and in other agriculture surveys not discussed) have made it clear that telephone data collection is an important part of the agency's overall program. Issues related specifically to telephone interviewing such as specialized training and questionnaire wording, are now being addressed more carefully by agency personnel. An example of this shift in direction is a large research project which began in 1981 to evaluate Computer Assisted Telephone Interviewing (CATI) for these surveys. The system is being used operationally in two states at this time. The cattle inventory survey became

the initial test survey for CATI, and the research is geared to measuring data quality improvements that may result from using online edit and consistency checks. Preliminary results from the study indicate that the use of these checks during an interview may help eliminate as much as 75 percent of related response errors. Examination of other issues such as cost, timeliness, and effect on survey management and interviewer training are still being investigated.

Case Study 3—Advance Retail Trade Survey

Purpose and Description. The Advance Retail Trade Survey data are used in the Advance Report which provides, a month before the full report, information on sales and inventories data for major retail groups such as car dealers, clothing stores, and appliance dealers.

In January 1951, the Census Bureau began publication of its monthly Retail Trade Survey. Preliminary data were processed and published for the full sample in the second month following the survey month. In order to produce this report sooner, a subsample was selected which could be speedily processed and provide the basis for an advanced report within 10 days of the end of the survey month. Publication of the advanced report began in October 1953.

Sample Design. For the full Retail Trade Survey a sample of 30,000 establishments is selected from the Standard Statistical Establishment List (SSEL) which has been stratified by Standard Industrial Classification (SIC) code and sales size. The selection is with probability proportional to annual sales. The smaller establishments are randomly assigned to panels which are periodically rotated so that overall about 12,000 establishments are canvassed each month. The Advance Survey uses a fixed subsample of 2,800 of the 30,000 establishments.

Field Methods. On or about the 26th of each month, a mail form is sent to each of the 2,800 sampled establishments for that month's sales and inventory data. Mail responses are sent to the Census Bureau's 12 regional offices. All establishments not responding by mail within 10 days are contacted by telephone from the regional office. The telephone interviewing is completed over the next 2 days and the raw data are transmitted from each regional office to Washington where it is processed. The advanced report is issued by the 10th of the month.

Consequences of the Use of the Telephone. About 25 to 30 percent of cases respond by mail before cut-off on the 5th; 65 to 70 percent are collected by telephone and about 7 percent are nonrespondents. These rates have remained fairly consistent throughout the history of the survey. The extensive use of telephone interviewing within a 2-day period, using 12 regional offices, provides the only practical means of ensuring a high level of response within so short a time frame. It makes it possible to release estimates of reasonable quality within 10 days of the end of each survey month.

SUBSEQUENT CONTACTS AFTER AN INITIAL CONTACT IN PERSON

Case Study 4—Current Population Survey

Purpose and Description. The Current Population Survey (CPS) is a monthly survey consisting of a core series of questions to determine whether individuals aged 14 or older in the households surveyed were employed, unemployed, or out of the labor force during the week before the survey. Additional questions obtain descriptive data such as hours

worked, industry and occupation, duration of unemployment, and reasons why people were not in the labor force. In some months, the survey is supplemented by questions on other socioeconomic topics such as income, work experience, fertility, and school enrollment.

Sample Design. The CPS sample design is a multistage, stratified sample of the United States population consisting of two independent national samples and three supplementary samples selected to increase the reliability of state and selected substate areas. The multistage plan is roughly equivalent to dividing the entire United States into sampling units, each containing about four housing units, and selecting clustered samples of these units for interview. Currently, about 60,000 occupied housing units clustered with 629 primary sampling units are contacted each month for the CPS.

Field Methods. Interviewing is done monthly during the week containing the 19th day of the month. Households in the sample for the first or fifth time are sent advance letters advising the household of the interviewer's forthcoming visit. All households in sample for the first time and most of those households in sample for the fifth time are contacted in person. Once a household has had a personal interview, it may be contacted subsequently by telephone, providing the respondent has agreed to this method of interview. Overall, households contacted by telephone represent 65 percent of all interviewed households. About 85 percent of those CPS households eligible to be contacted by phone are interviewed by telephone. The CPS program employs approximately 1,400 interviewers; the average interviewer work load is approximately 50 cases per month. The average interview takes approximately 10 minutes.

Consequences of the Use of the Telephone. Preliminary data from the CPS suggest that roughly 95 percent of the civilian noninstitutional population have telephones available; however, only approximately 87 percent have telephones in their homes. Differences exist with respect to telephone ownership by race and ethnic background. Approximately 88 percent of Whites have telephones in their homes, compared to 80 percent of Blacks and Hispanics. Roughly 80 percent of the unemployed own phones, while 88 percent of the employed and 86 percent of persons not in the labor force own phones. Hence, a labor force survey conducted solely by telephone could produce biased results. Recently, as a cost-saving method, the CPS encouraged interviewers to use the telephone as much as possible. Prior to this modification, the overall telephone interview rate was approximately 60 percent or about 82 percent of the households eligible for telephone interviews. These rates have now increased to approximately 65 percent and 85 percent, respectively. As far as is known, this slightly increased use of the telephone has not adversely affected the quality of labor force data.

Major Problem Areas, Issues. From data obtained from the CPS, it may be concluded that if all interviewing were conducted by telephone, coverage problems would exist as a result of differences in telephone ownership between racial and ethnic groups, especially between Whites and non-Whites. As these differences are significant with respect to labor force status, particularly for the unemployed, exclusive use of the telephone for this group could have adverse consequences on the quality of data for surveys such as the CPS.

Case Study 5—Quarterly Household Survey

Purpose and Description. The Quarterly Household Survey (QHS) provides data for the Survey of Residential Alterations and Repairs (SORAR) which includes dollar expenditures for residential housing alterations, additions, remodeling, repair, major replacements, maintenance, etc. Its primary uses are for input to the GNP accounts, and for the industries involved in home repair to assess their respective positions and to aid in future planning.

Data are collected from a sample of households during the first 10 days of each calendar quarter for the previous quarter by Census Bureau field interviewers. Preliminary estimates are issued about 30 days after the end of each calendar quarter.

Sample Design. The sample consists of housing units selected in 103 Primary Sampling Units (PSUs) which are a subsample of PSUs used for the Current Population Survey (CPS). As with CPS, clusters of four housing units are selected.

About 1,000 newly selected units are added each quarter, and roughly the same number are rotated out. In a particular quarter, about 6,000 respondents are contacted. These fall into two major groups:

- a. One-to-four unit owner-occupied properties.
- b. Rental or condominium properties and all properties with five or more units.

Units considered as out-of-scope are mobile homes and group quarters such as dormitories, nursing homes, convents and prisons.

Field Methods. Each unit selected for QHS remains in the sample for seven consecutive quarters. The first interview is always conducted in person by a Census Bureau interviewer. The interviewer will determine whether the unit is in scope of the survey and if the property is one-to-four unit owner-occupied. The initial interview also serves as a bound for the reference period for the next interview so that only jobs done during the appropriate time will be included in later reports. Data from the initial interviews are not used for tabulation since the initial interview is not bounded. Studies have shown that respondents often include information about events occurring prior to the stated reference period (telescoping) in the first report, making the reports very unreliable and they are, therefore, not used for tabulation.

If the sample unit is rented, a condominium or on a five or more unit property, the interviewer is instructed to obtain a mailing address for the owner or manager of the property. Subsequent data collection for these properties is done by mail with telephone follow-up from the 12 Census Bureau regional offices. For one-to-four unit owner-occupied properties, at the end of the initial interview, the interviewer obtains a telephone number and the best time to call, so later contacts may be made by telephone if the respondent agrees to do so.

About 3,500 of the 6,000 respondents contacted quarterly, fall into the owner-occupied category. About 85 percent of the second quarter and later interviews in this category are done by telephone from the interviewer's home.

Consequences of the Use of the Telephone. The use of telephone interviewing for QHS was introduced in two stages. When the survey was first done in 1963 all seven interviews were done by personal visit. In 1974-1975, half the sample continued with all personal visits but for the other half, telephone was used for the second, third, fifth, and sixth interviews. A comparison of the two half-samples showed no statistically significant difference in the data or in response rates (about 98 percent). However, there was no difference in the field costs, either, since the largest component of the survey costs was the cost incurred in travel from the interviewer's home to the sample units. By continuing to conduct half of the interviews in person, the overall amount of travel was hardly reduced. The use of telephone was expanded to the entire sample in 1976 resulting in a reduction in data collection costs. This shift was generally accepted by the respondents. With further budget cuts in 1981, all interviews after the first were conducted by

telephone. When this was initiated, an additional 15 percent reduction in data collection costs was realized.

One possible problem with QHS is the decentralized phone contact which provides no supervisory controls or monitoring of the interview. Costs could be reduced and supervisory control could be improved if centralized Random Digit Dialing (RDD) were used. But RDD presents certain problems. Without the personal contact, it may be difficult to determine whether a unit is in scope of the survey and, if so, whether it is on a one-to-four unit owner-occupied property. If it is a rental, condominium, or five or more unit property, it may be difficult to get a mailing address (or telephone number) of the manager or owner of the property. Also, the initial interview being done in person may establish a rapport with respondents which increases the survey response rate.

INITIAL CONTACT FROM A LIST SAMPLE

Case Study 6—The Nonresidential Buildings Energy Consumption Survey

Purpose and Description. The Nonresidential Buildings Energy Consumption Survey Update (NBECS II) was designed by the Energy Information Administration. The original NBECS was a personal interview survey conducted with building owners or managers in 1979-1980. The survey was designed to get an estimate of the number of nonresidential buildings in the United States as well as information related to energy consumption in the commercial sector. Respondents were asked about the structural and operational characteristics of their buildings, e.g., square footage, uses of the buildings, number of employees, hours of operation, conservation practices, types of energy supplied. At the conclusion of the interview, respondents were asked to sign an authorization form to enable their energy suppliers to release energy consumption and expenditure data for their buildings. The consumption and expenditure data were collected from the suppliers through the mail.

The NBECS II follow-up telephone survey recontacted building owners who reported in the 1979-1980 survey. A sample of buildings constructed after the original sample was drawn (mid-1979) to keep the sample current. The purpose of the update is to describe the current nonresidential building stock, changes in the buildings' structural and operational characteristics, and patterns in energy consumption and usage. These last data are supplied by utility companies, contingent upon authorization by building occupants.

Sample Design. The sampling unit for this survey is the building. Buildings were selected using a multistage area probability sample design supplemented by a list of large buildings. Samples of new construction were drawn separately for each year between 1979-1982 from the F.W. Dodge tapes of new construction and added to the frame to keep it current. This sample is a random sample stratified by ten size classes.

Field Methods. A telephone screening was conducted for the new buildings in the sample to determine when the building was/will be completed and to locate a knowledgeable respondent (and their telephone number).

Respondents from the original buildings were first contacted by letter and then by telephone to obtain the interview. Following the interview, respondents were sent forms identifying the utilities used and requesting authorization to collect information from them. Finally, the utility companies will be sent the authorization forms and be asked to provide consumption and expenditures data for the sample buildings.

In a sizeable number of cases, the introductory letters were returned because the buildings have either changed or had been demolished. A telephone screening was conducted to try to obtain the name and telephone number of the current occupants.

The same procedures were followed for the newly constructed buildings that were added to the sample. However, respondents from the new buildings were given the original interview by phone (which took about 30 minutes) as opposed to the update interview (which took 15-20 minutes).

Consequences of the Use of the Telephone. The overall response rate for the telephone survey was 89 percent which is comparable (but slightly lower) to that achieved during the personal interview phase.

Although 2nd wave response rates for structural characteristics and operational use did not suffer a decrease from Wave 1, problems have occurred in obtaining the signed authorization forms. For the consumption and expenditures data in the original survey, waivers were signed by approximately 90 percent of the interviewed respondents. Seventy percent of the respondents completed the forms and returned them in the mail following the telephone interview. A substantial amount of field follow-up raised the response rates to 91 percent.

For most buildings, the occupants will still be the same ones as in 1979. Thus, using the telephone to update information for this group will be more efficient than personal interviews. However, the use of the telephone makes it much more difficult to find an appropriate respondent when the building occupants have changed. Using the telephone also makes it difficult to find out that a building has been demolished.

The consequences of using the telephone on data quality will be determined after the interviewing of the new building sample is completed. Data from the original interviews, conducted in person, can be compared with the same information collected over the phone.

Case Study 7—Household Transportation Survey

Purpose and Description. The Household Transportation Survey was designed by the Energy Information Administration to provide data on energy consumption for motor vehicle transportation within the residential sector. The purpose was to provide monthly and annual estimates of fuel consumed and miles driven by individuals. Respondents were characterized by a variety of descriptors such as family income, vehicle size, model year, and geographic location.

Sample Design. The sample unit for this survey was the household. Households were selected according to a multistage probability sample and randomly assigned to one of six groups. One group was brought into the sample each month and reported information for 2 consecutive months, was dormant for 4 months, and then reinterviewed for 2 more months.

Field Methods. Selected households were first contacted by letter and presented an incentive payment of \$5 per vehicle. Background information was obtained by telephone interview.

Shortly before the first day of the reporting month, fuel purchase logs and instructions were sent to each household. A telephone call followed the mailing of these materials by

a few days to ascertain their receipt and a mid-month call was made to answer questions. Sample households were requested to complete monthly logs for each of their vehicles to determine expenditures and consumption. Four or five days after the end of the month, respondents were phoned to collect the data from the fuel purchase log.

Consequences of the Use of the Telephone. Data were fairly consistent and all items were reported for most cases; only about 25-35 percent of the returned cases needed to be recontacted each month to collect missing data or resolve inconsistencies in variables such as miles driven, gallons of gasoline purchased, etc. The response rate improved considerably over time ranging from a low of 49 percent in November 1979 to a high of 72 percent in April 1981. Average monthly response rates by year:

June-December 1979	53.9%
January-December 1980	62.0%
January-September 1981	68.7%

It is believed the major contributor to the increase in the response rates from year-to-year is the addition of respondent incentives. During the first time period, no incentive was offered. During 1980, a \$5.00 payment was offered to an increasingly large subgroup on a test basis. When the incentive proved to be effective, a \$5.00 incentive was given to all sample members in 1981.

Major Problem Areas, Issues. Approximately 15 percent of the households could not be reached by telephone. This subgroup was contacted by the more expensive personal interview approach. At this time, it is not known whether or not there are significant differences between the two groups or whether people reported differently in person as compared to those interviewed by telephone.

Case Study 8—The Long-Term Care Survey

Purpose and Description. The Long-Term Care Survey (LTC) is a survey conducted by the Bureau of the Census for the Department of Health and Human Services. It was designed to provide nationally representative data on noninstitutionalized persons who were 65 years old or older who had long-term health needs. Data included:

- The number and characteristics of aged noninstitutionalized persons with various degrees and kinds of physical impairment.
- The kind and amount of formal and informal health-care services these people receive.
- The out-of-pocket cost of formal health-care services received and the person's ability to pay for the services.
- The number and characteristics of impaired aged persons not receiving health-care services.
- The relationship of the health-care services received to the type and degree of impairment.

Sample Design. The sampling frame for this survey was constructed by drawing about 55,000 cases from the Medicare file of persons 65 years old and older who lived in one of

173 primary sampling units (PSUs). To help defray survey costs, fifteen thousand of the sample cases were screened by telephone to estimate the percent of aged who were impaired. A yield rate of about 18 percent resulted which was comparable to the yield rate obtained from personal interviews without telephone screening (about 17 percent). As yield rates from telephone and personal screening were about the same, 21,000 additional cases of the 55,000 were set aside for telephone screening. Those people who could not be reached by telephone were scheduled for personal interview to assure that the results of the study were representative for all impaired, aged people receiving Medicare.

Field Methods. The sample listings contained the names and addresses of the persons receiving Medicare. As current telephone numbers were not available from the file, a telephone number look-up operation was mounted in each of the 12 Census regional offices. Once the telephone number look-up was completed (telephone numbers were found for 27,350 of the 35,750 sample cases), cases were designated for either telephone or personal visit screening. As a further cost-savings measure, a letter was sent to people for whom a telephone number could not be found, requesting that they make a toll free call to the regional office or send back the lower portion of the letter including their telephone number so that if they had one, a telephone screening could be done. Through these methods, more than 75 percent of the sampled persons were initially contacted by telephone.

Persons in the sample were interviewed whenever possible; proxy-respondents were accepted only if the sample person was not physically or mentally capable of responding. If a telephone number was located for a sample person, the interviewer was instructed to place up to ten telephone calls at different times in order to make contact. Interviewers were also instructed to let the telephone ring at least ten times since an impaired person might take longer to answer the telephone. If contact could not be made or if a person refused the telephone interview, the case was assigned for a personal-visit interview.

The screening interview inquired whether the respondent could independently perform nine everyday activities (e.g., bathing, eating, dressing) and seven instrumental activities of daily living (e.g., prepare meals, do laundry, take medicine). If the person was unable to perform one or more of these activities without help, the person was considered impaired and a detailed personal interview was conducted. Screening interviews completed by telephone took 5 minutes. Personal screenings, on the other hand, took about 10 minutes. The reasons for this difference have not been fully developed, but it has been noted in other surveys that more interviewer respondent interaction occurs in personal interviews, increasing the length relative to telephone interviews.

All persons screened into the survey were interviewed by personal visit. It was believed that because of its length (30-45 minutes) and complexity, the detailed interview on long-term care needs based on current impairment could be completed more successfully in person than by telephone.

Consequences of the Use of the Telephone. It is estimated that the cost of the telephone screening was only about one-eighth of the cost of the personal visit screening; however, exact costs for personal screening cannot be derived because they were conducted concurrently with the detailed personal interviews. However, from a cost standpoint, initial telephone screening with personal interview contingent upon positive indication of impairment, was more efficient and less expensive than concurrent personal screening and interviewing.

Response rates for the telephone screening were excellent: 96 percent of the persons for whom a telephone number was located were contacted by telephone, of this group, 95

percent completed the screening interview. About 6 percent of the people originally selected were no longer eligible for the survey because they had entered institutions, moved out of the country, or had died.

Major Problem Areas, Issues. Had the screening been limited to those persons who could be contacted by telephone, almost 27 percent of the sample would not have been contacted. Thus, survey findings derived exclusively from data based upon telephone screenings would have been misleading if respondents with telephones differed from those who lacked them. Data addressing this issue are being analyzed and will be available in the near future. The results of this telephone/personal-visit hybrid survey suggest that important advantages of telephone surveys, i.e., lower cost and quick turnaround time, may be blended with more expensive personal interviews (warranted by length and complexity of survey questions) to yield statistically reliable data at reduced overall cost.

Case Study 9—Mobile Home Placement Survey

Purpose and Description. The Mobile Home Placement Survey (MHPS) is conducted by the Bureau of the Census for the Department of Housing and Urban Development (HUD). It provides quarterly data on the number of new mobile homes placed for residential use, the average sales price of these homes, and dealer inventories at the end of the quarter. Data are provided by Census Region and by number of sections in the mobile home unit. Annual tabulations provide information on selected physical characteristics of the units placed such as type of foundation, presence of central air conditioning, number of bedrooms, etc. The current survey methodology, using telephone as the primary medium for data collection, was introduced in 1979. It replaced a mail survey, with telephone follow-up of nonrespondents, which was begun in 1974.

Sample Design. Each month the National Conference of State Building Codes and Standards (NCSBCS) receives lists of mobile homes shipped to dealers from each mobile home manufacturer in the United States. These lists show the HUD I.D. number(s) of each mobile home shipped the previous month, the number of sections in the unit, and the name and city of the dealer to whom it was shipped. Copies of all these lists are sent to the Census Bureau each month and provide the sampling frame for the MHPS.

Individual mobile home units are systematically selected from the manufacturers' lists at a rate of 1 in 40. This yields a sample of about 600 units per month. The sampled units are grouped by dealer and a reference file (maintained and updated by Census) of about 12,000 dealers is checked to provide telephone numbers. If a dealer is not found in the reference file, local telephone directories and/or directory assistance is checked. An advance letter is sent to each dealer of a sampled unit explaining the type of information to be collected and that he (she) will be contacted by telephone.

Field Methods. Each sampled dealer is contacted every month by the Census central telephone interviewing unit in Jeffersonville, Indiana until the sampled unit is placed on site. Including newly sampled and backlogged units (i.e., units reported as not placed in previous months) the total work load is about 1,800 units per month (about 1,300 dealers).

Consequences of the Use of the Telephone. About 80 percent of dealerships are listed on the Census reference file. An additional 18 percent are located through local directories. Of those contacted, about 5 percent have requested to mail in the data reports, and about 6 percent are nonrespondents. (The survey is voluntary.) Including the 2 percent for which no phone number or mailing address is found, the overall nonresponse rate averages about 8 percent. Under the original survey, with a fixed panel, mailout and telephone

follow-up the percentage of telephone response steadily increased; from 35 initially to 60 percent just prior to the changeover in procedures. This occurred as respondents became aware of the follow-up procedures. During the pilot study for the survey redesign, a sample of dealerships was asked if they preferred telephone over mail response; 90 percent did.

With the use of virtually all telephone interviewing, field costs have remained about the same, but processing time has decreased dramatically. Reports can now be compiled earlier as there is no longer the waiting period for mail check-ins and cross-checking for nonresponse before the telephone follow-up. Also, the nonresponse rate has been cut in half; from 16 to 8 percent.

INITIAL CONTACT USING RANDOM DIGIT DIALING

Case Study 10—Survey of Consumer Attitudes

Purpose and Description. The Survey Research Center at the University of Michigan began its program of periodically surveying attitudes and expectations of U.S. Consumers more than 35 years ago. The quarterly surveys ask approximately 40 core questions about personal finances, business conditions and buying expectations.

Although changes in consumers' willingness to buy may be best determined by examining answers to all questions asked in the surveys, a summary measure of change in consumer sentiment has been constructed based on answers to five questions. The questions concern the following issues:

- Personal financial position now vs. 1 year ago.
- Financial circumstances 1 year from now.
- National business conditions 1 year from now.
- Good or bad national economy.
- Is now a good time to buy major household goods?

For comparative purposes, scores relating to responses to these questions have been formed into an index in which a relative score is calculated for each question separately. An average is then taken over the five relative scores, and the result is adjusted to the base (February 1966 survey = 100).

As changes in attitudes and expectations are assumed to precede behavior, measures of consumer attitudes and expectations are used by national policymakers as indicators of change regarding potential aggregate economic activity in the United States.

Sample Design. The samples for the Surveys of Consumer Attitudes are designed to be representative of all private households in the contiguous United States. Over the history of these surveys, the sample design and survey methodology has included both personal interviews (using multistage area probability methods to select a cross-section of private dwellings), and telephone interviews (using samples selected from all private households, based on random digit dialing techniques). The basic sample designs differ in that personal interview surveys use census data to assign probabilities of selections to areas (such as counties, cities, towns, or blocks), whereas, national telephone surveys use the

unique ten-digit identifier of telephones to generate a random selection of private households.

Historically, the Survey of Consumer Attitudes was conducted only by personal interviews during the 1950's. Personal interviews remained the dominant form of data collection in the early 1960's, although telephone reinterviews of respondents first interviewed in person at home were interspersed at irregular intervals. Since 1976, random-digit-dialed telephone samples have been the dominant form of data collection.

The selection of the sample households, under both designs, is performed after stratification by geography and the level of population density. Stratification by these criteria assures a balanced sample representation of different geographic regions and metropolitan size categories.

Field Methods. The Survey Research Center maintains a staff of approximately 300 field interviewers located in the primary sampling areas, and approximately 30 telephone interviewers who work at the Telephone Interviewing Facility located at the Survey Research Center.

Telephone interviewers are assigned the computer generated telephone numbers at random. In order to make a contact at each number, up to 24 calls are made in a systematic fashion at different times of the day and on different days of the week. After a contact is made, the interviewer determines through screening procedures that a household (rather than a business or institution) has been reached. Then a listing of household member is obtained and a selection table used to randomly choose the designated respondent. Often the interviewer must schedule an appointment to conduct the interview with the designated respondent. The telephone interviews usually average approximately 25 minutes in length; however, at various times in the survey's history the average length has ranged from 15 to 50 minutes (Curtin, 1982).

Consequences of the Use of the Telephone.

Several analyses have been performed (Groves and Kahn, 1979) to determine if differences in sampling methodologies have led to differences in responses to identical questionnaire items. These studies found minor, but not significant, differences in overall response patterns.

Recently, Steeh (1981) reported on nonresponse rate trends from 1952-1979 using data from two major Michigan surveys: National Election Studies and Survey of Consumer Attitudes. The long-term trend was up for both from around 6 percent in 1952 to around 16 percent in 1976. The switch from personal interviews to random digit dialing in 1976 for the Survey of Consumer Attitudes saw the nonresponse rate increase from approximately 15 percent to approximately 25 percent for the initial random digit dialing interviews. However, with subsequent experience, the Center has reduced nonresponse to approximately 15 percent in 1979.

Groves and Kahn (1979) concluded that personal interviews cost something on the order of twice that for telephone interviews.

Major Problem Areas Issues. Nonresponse rates to random digit dialing interviews appear to have stabilized at roughly 15 percent from approximately 25 percent immediately after transition from personal to telephone interviewing in 1976. This is about the same level as that for personal interviews prior to 1976. While further reduction in nonresponse is desirable, it might not be possible nor warrant the additional cost.

Case Study 11-Health Interview Survey-Random Digit Dialing Study

Purpose and Description. In 1978 the National Center for Health Statistics (NCHS) contracted with the Survey Research Center (SRC) of the University of Michigan to conduct research on the application of telephone survey methodology to NCHS data collection needs. This research had three primary purposes: (1) to compare and evaluate face-to-face and telephone interview methods for collecting data in the National Health Interview Survey (NHIS), (2) to conduct a number of methodological experiments specific to a national random-digit-dialed (RDD) telephone survey, and (3) to examine selected components of error in telephone surveys.

Sample Design. In the fourth quarter of 1979, SRC conducted a national probability RDD telephone survey of persons 17 years or older, using a modified NHIS questionnaire. At the same time, the Bureau of the Census was conducting the ongoing NHIS. The NHIS is a personal household interview survey with a multistage probability sample design. The SRC survey and the NHIS yielded data on 8,200 and 19,800 persons 17 years or older, respectively.

Field Methods. The research design for the SRC telephone survey included the random assignment of sample telephone numbers to a set of treatments, resulting in experimental groups:

Experimental Interviewing Procedures. Families were assigned to one of two interviewing methods. The "control" version specified a behavior on the part of the interviewer that was similar to that of Bureau of the Census interviewers. The "experimental" version used explicit instructions and feedback to the respondents written into the questionnaire and also sought a commitment from the respondent to answer carefully and honestly.

Respondent Rules. Two alternative respondent rules were used. In the "knowledgeable adult" half-sample an adult judged as capable of answering the health questions responded for all adults in the family. In the "random respondent" sample, one person 17 years or older was randomly selected to respond for all adults in the family.

Computer-Assisted Telephone Interviewing (CATI). Random half-samples of telephone numbers were assigned to either a "CATI" or "paper and pencil" version of the questionnaire.

Consequences of the use of the Telephone.

Differences between Telephone and Personal Interview Data. A major component of this research was a comparison of data obtained by the face-to-face interview using area probability sampling (the NHIS) and that obtained by the telephone interview using random-digit-dialed sampling (the SRC telephone survey). This comparison is addressed in terms of response rates and response differences between the two modes.

The overall response rate for the SRC telephone survey was 80 percent. This is well below the 96 percent achieved with the NHIS. However, the telephone rate is consistent with that achieved in many personal interview surveys conducted by survey organizations other than the Bureau of the Census, and is higher than that obtained by most telephone surveys. The higher than usual telephone response may be attributable to a variety of characteristics of the project: the legitimacy of the Public Health Service as the sponsor, the topic of health events, the lengthy training of the interviewers, continual monitoring, and high morale of the staff.

An analysis of estimated response rates for demographic subgroups within the telephone survey revealed significantly lower response rates for the poorly educated, for young adults, and the elderly. The latter should cause some concern for researchers interested in health variables because of the usual increase in health problems with advancing age.

The findings on response differences between the NHIS and the SRC telephone survey showed consistently higher reporting of health events among the telephone respondents than among the face-to-face respondents. That is, the majority of measures used indicated more reporting for the SRC telephone respondents than for the NHIS respondents. Additional analyses were performed to determine if subgroups of the population exhibited variation in the differences between modes and to search for other interactions in mode effects. However, it was found that higher levels of reporting among telephone respondents appeared within all age, gender, and education groups.

As with most studies comparing modes of data collection, this research was not able to measure a pure effect of mode; i.e., unconfounded by differences in interviewing staffs, questionnaire form, nonresponse errors, etc. However, it is worth noting that while there was generally greater reporting of health events in the telephone survey, the magnitude of differences between the two modes was generally small. In any case, the findings suggest that the initial NCHS concerns of major difference in data quality between the ongoing NHIS using face-to-face interviews and a telephone NHIS were unfounded.

The Experimental Interviewing Techniques. Sample cases in the SRC telephone survey were randomly assigned to one of two interviewing treatments. The "control" procedures attempted to approximate an NHIS interview as conducted by the Bureau of the Census; i.e., to standardize interviewer behavior as much as possible across modes. This approach restricted the interviewer to asking questions, as worded in the questionnaire and to using specified probes and introductory statements. For comparison to this procedure, an "experimental" treatment was administered to the other half of the telephone sample. This procedure, developed by SRC in previous research, incorporated three techniques in the questionnaire: commitment, instructions, and feedback. Commitment involved a verbal agreement by the respondent to give accurate and complete information. Instructions were in the form of statements in the questionnaire at various points for the interviewer to read (e.g., "This is sometimes hard to remember, so please take your time.") Feedback was both positive ("I see, this is the kind of exact answer we need.") and negative ("You answered that quickly. Are there any days you might have overlooked?").

For almost all health events, there were higher levels of reporting for the experimental group than for the control group. Further analysis was performed on different demographic subgroups in order to search for interaction effects in the experimental interviewing methods. Age, gender, and education were used as predictor variables. In general, the effects of the experimental treatment were not reduced when controls for respondent characteristics were applied. The experimental techniques appeared to facilitate increased reporting on health variables in this study.

The Effects of Respondent Rules on Health Survey Reports. Two respondent rules were used in the SRC telephone survey to facilitate a comparison of responses based on self-reporting and on proxy-reporting. Interviews in half of the sampled households were conducted with a "knowledgeable" adult respondent (often an adult answering the telephone). The other half of the interviews were conducted with a randomly chosen adult. In each case, the respondent reported for all adult family members.

The results of this study were compared with those of a previous NCHS study designed to measure the effect of proxy reporting on health statistics in the NHIS. The hypothesis

that maximum self-reporting would yield higher rates of illness and medical utilization than the standard NHIS procedures (which allow proxy reporting) was supported in the earlier NCHS research. While similar results were expected with the present study, a different pattern of findings emerged. In particular, the SRC study found higher levels of illness and utilization reporting for "proxy-respondents" than for "self-respondents." Additional analyses, both between and within the two respondent samples in the telephone survey, did not alter this finding. Further, even after applying multivariate models to adjust for nonresponse differences, significant proxy effect remained. This overall tendency toward higher proxy reports runs directly counter to previous findings about self versus proxy reports. While there are several hypothesis which might explain the effects observed in this study, few are testable without the collection and inspection of verifying data.

A Comparison of CATI and Non-CATI Questionnaires. The research design for the SRC telephone survey also included the random assignment of half-samples to one of two modes of the questionnaire. Half were assigned to typical paper-and-pencil questionnaires and half were assigned to questionnaires programmed into a computer-assisted-telephone-interviewing (CATI) system. Since the random assignment was made on a sample number (or household) basis, all of the adults in the same household were given the same treatment. Each interviewer used both of the modes of asking question, alternating modes each week.

On most of the criteria examined in this study, there were only small differences between the CATI and the paper-and-pencil versions of the questionnaire. The sample for the SRC telephone survey consisted of three replicate groups. While CATI response rates were lower than non-CATI rates for the initial replicate because of hardware problems and the interviewers unfamiliarity with the CATI, the CATI and non-CATI response rates were identical for each of the latter two replicates. Thus, it can be concluded that the use of CATI had no significant effect on response rates. There were also no major differences between the two interviewing modes in the character of responses. An examination of a variety of health measures yielded few differences. In addition, an assessment of preferences of the interviewers revealed no major differences between the two modes.

There were, however, some exceptions to this finding of equivalence between methods. The average number of minutes per CATI interview exceeded the average for the non-CATI interview. This result was largely a function of the relatively slow response time of the CATI system used in this study. This problem can be eliminated in future CATI designs. There also was some evidence that the estimates of interviewer variability tended to be lower in CATI than in non-CATI. These latter two findings are indicative of some of the potential benefits of CATI systems. In addition, there was evidence of fewer skip pattern problems with CATI.

Measurement of Interviewer Errors in the Telephone Survey. This study used an interpenetrated design for assignments to interviewers in order to measure certain components of interviewer variance present in the data. In addition, a monitoring procedure was constructed in which a supervisor listened to the interview and coded each interviewer behavior according to whether or not it conformed to techniques and procedures in which the interviewers had been trained. This approach, containing both an interpenetrated design for interviewer assignment and systematic monitoring procedures, permitted investigation of whether the rules prescribed for interviewer behavior are related to the magnitude of interviewer contribution to the variance of the survey statistics; specifically, it permitted an assessment of whether guidelines for interviewer procedures are closely related to interviewer variance.

The major finding from this research was that unusually low levels of interviewer effects were measured in the telephone survey. This may be a result of the stringent controls on interviewer behavior that were introduced in this study but were absent in past studies. The low interviewer differences inhibited attempts to explain interviewer variability on the health items. Since there was little interviewer variability, the correlates among the monitoring data were weak and the findings did not exhibit consistency across variables.

Nonsampling Bias and Variance in the Telephone Survey Data. The purpose of this analysis was to examine the data for any relationship between the experimental interviewing procedures effect on response bias and the values of the interviewer variance for the two half-samples. That is, did the experimental interviewing procedures reduce response bias at the cost of increasing the magnitude of interviewer variance? That question is investigated by combining the results from the comparison of statistics on the two experimental groups with the changes in values of intraclass correlations for the same statistics. While the findings are limited by the small number of statistics examined, they dismiss the possibility that the increases in reporting associated with the experimental interviewing behaviors were coming at the expense of greater variability in interviewer behavior.

CHAPTER V

RESEARCH AND DEVELOPMENT ISSUES

INTRODUCTION

Current research and development work in telephone interviewing focuses on seven issues:

- Costs
- Response Rates
- Coverage
- Interview Medium Bias
- Interviewer Monitoring, Training and Evaluation
- Computer Assisted Telephone Interviewing (CATI)
- Dual Frame Surveys

The reader should be aware the issues are intertwined. Although discussed separately in this chapter, research in one area can have important implications to others.

Historically the use of the telephone by Federal agencies has been in combination with mail or face-to-face interviewing for screening, appointments and follow-up for nonresponse. Currently there is a trend toward the use of the telephone as a primary mode of data collection. The needs to reduce costs and to provide data in a more timely manner provide major impetus for this change. Concurrently, the development of new methodologies such as random digit dialing (RDD) and computer assisted telephone interviewing (CATI) make the telephone a more viable mode of data collection.

COSTS

A cost model should be as complex as the organization needs it to be. Are ad hoc procedures useful enough to provide satisfactory design options, or would a five percent error in cost per completed interview mislead an agency and cause it to make incorrect judgements? Current literature points to the need for more complex models in many situations. These studies show the need to develop more accurate estimates of the parameters traditionally included in cost analyses, and place even more emphasis on the need to include more complex effects in the projections. These effects include administrative structure, nonsampling errors, expected response rates, economies of scale, and robustness of the cost data.

Administrative structure affects the cost of telephone data collection by specifying 1) the location of calling centers, 2) whether centralized, regionalized, or completely decentralized telephoning is used, 3) the type of telephone lines used, and 4) the equipment such as telephones, headsets and computers used to collect data. All such

factors affect cost and should be completely specified in an appropriate cost model in order to project cost accurately.

Groves and Lepkowski (1982) develop cost models for four administrative structures using telephone data collection for a proposed dual frame design for the National Crime Survey, and measure the gains in precision for selected variables. One frame produces an area probability household sample, and the other frame is a list of residential telephone numbers, which are called first and followed-up by personal interview. From this study they project that telephone interviewing by interviewers working out of the twelve regional offices has the highest average gain in precision over three other administrative structures: personal interviewers calling from their own home, a co-located headquarters/centralized telephone interview facility, and several regionalized telephone interview facilities.

Perhaps the most striking result from the Groves and Lepkowski research is the complexity of the cost models themselves. A cost structure typically used for optimum allocation of a dual frame survey usually contains three cost components, an overhead cost and constant costs associated with each frame. The cost models developed by Groves and Lepkowski have six to nine components each, depending on the particular administrative structure being developed. There was considerable effort to make ad hoc estimates of the coefficients associated with the various cost components. Future research needs to consider ways of developing methods to obtain cost coefficients and models on a continuing basis.

The report by Groves and Lepkowski states the need to account for the effects of nonsampling errors associated with a given administrative structure. The relative costs of telephone interviewing and the particular administrative structure used for the data collection must be compared to the quality of the data obtained. For example, the potential that the centralized interviewing facility has to control interviewer effects may justify the increased overhead costs for such a facility. Dillman (1978) calls for the use of centralized interviewing facilities to reduce nonsampling errors. Groves and Lepkowski do not have adequate data to address the potential impact of these errors in their models, but recognize the need to continue research in this area, since it appears that the advantages of regionalized or totally centralized telephone interview facilities can control or reduce nonsampling errors. Similarly the expected response rate on a telephone survey, and the procedures developed to deal with inaccessibles and refusals will directly affect both survey costs and data quality.

Organizations which conduct many surveys should concern themselves with the impact of economies of scale associated with these multiple survey operations. Cost data is usually available only on a survey by survey basis. However, as more and more data collection is conducted by telephone, the fixed costs associated with overhead will have to reflect the multiple uses of the equipment and personnel. In fact, the overhead structure, particularly for a CATI facility, may have to be completely rethought because the hardware may be channeled into other uses while it is not being used for data collection.

A major difficulty associated with cost data is its limited potential for generalization. Different surveys have different targeted populations, different degrees of complexity, different lengths of data collection periods and different overhead structures. These facts limit the usefulness of cost comparisons between surveys, organizations, or modes of data collection. Under these limitations several cost comparisons are discussed below. Most are presented in terms of completed questionnaires.

Dillman (1978) finds that costs for four mail surveys differ by over 75 percent, while the telephone costs for these surveys (from a central location) would cost at least 2.5 times as much per completed questionnaire. Massey, Marquis and Tortora (1982) report that the cost of a mail survey of farm operators (with a 50 percent response rate) is nearly equal to the telephone costs. Telephone interviewing costs between 40 -60 percent of the face-to-face costs. The Statistical Reporting Service of USDA finds that the costs of a telephone and personal interview average about four and thirteen times, respectively, that of a mail return. This result comes from the agency's livestock inventory surveys, where an interview lasts ten to fifteen minutes.

The introduction of CATI can cause major changes in cost profiles, and these changes need to be appropriately included in the models. Nicholls (1983) identifies the direction of major cost implications even though their magnitudes have not been measured. He classifies them as: 1) known additional costs, 2) know or anticipated savings, or 3) areas of uncertainty. Included in known additional costs are such items as: a) hardware, b) software development, c) site preparation, rental and furnishing, and d) system and operations support. The hardware may not be dedicated to telephone interviewing alone, but may also be used for such functions as direct data entry, remote job entry, data analysis, or word processing. This shared usage will reduce the direct cost of the hardware for telephone data collection and should be reflected in the models. Software may be the major cost associated with CATI telephone interviewing, since the CATI software needed for instrument design can be quite difficult to develop. Known cost savings will come from the elimination of separate data entry steps, improved survey management and other issues discussed more specifically under CATI in this chapter. Implications of cost are uncertain for staff training and supervision and for survey and questionnaire design and development. On-line supervisory functions, increased monitoring capabilities and computer aided instruction may or may not fully compensate for increased interviewer training and supervision. Recurring costs for CATI instrument development for specific surveys should be a function of instrument length and developer expertise. This should decrease over time as an organization gains CATI experience.

Finally, cost evaluations will have to be made anew because of a recent change in the Federal Telephone System (FTS) billing algorithm. Now, calls made during non-business hours will be charged to each Agency.

RESPONSE RATES

Achieving adequate response rates for telephone surveys will be a major concern of federal agencies over the next several years. Can a ninety percent or higher response rate be achieved for telephone surveys, or is that too much to expect? Is seventy-five percent good enough if there is a face-to-face interview follow-up? Can an eighty percent response rate be lived with if face-to-face follow-up cannot be done? Before these and other questions can be answered a more fundamental question --"how will the telephone response rates be calculated?" --needs to be addressed.

Current literature suggests several ways of calculating response rates. The Subcommittee does not recommend a particular formula. In fact, the survey organization may find it worthwhile to use more than one calculation of response rate. We do feel it is important to be aware that response rates are not always calculated in the same manner, and this makes many direct comparisons inappropriate.

Two popular response rate formulations are:

$$\text{response rate} = (\# \text{ completed} / \# \text{ in sample}) \times 100.$$

and,

$$\text{response rate} = \# \text{ completed} / (\# \text{ in sample} - (\text{noneligible} + \text{nonreachable})) \times 100.$$

Noneligible is defined as the number of telephone numbers where a contact was made, but the reporting unit did not belong to the target population. Nonreachable is defined as the number of telephone numbers where no contact is made. The first formula shows how well one has done in reaching all potential respondents, while the latter formula gives an indication of the response rate among those potential respondents where a response is possible. To facilitate comparisons among researchers, organizations should publish the specific formula they used to calculate the response rates, and along with it, the necessary data to calculate response rates in accordance with other generally acceptable formulas.

Telephone response rates vary considerably between different organizations and different surveys in the same organization. NCHS reported a seventy-five percent response rate (based on persons responding) in an RDD survey. The Census Bureau received ninety percent response on a small study in Michigan. However, even with prior written notification, a survey conducted for USDA using a list sample of North and South Dakota farm operators only achieved a seventy-five percent response rate. The twenty-five percent nonresponse in this study consisted of thirteen percent refusals, seven percent without phones and five percent inaccessible.

Massey, Marquis and Tortora (1982) identify the need to find variables that can predict response in telephone surveys for a variety of populations. They also discuss the problems of maintaining response rates in panel surveys. Is the increased cost of prior notification justified by an appropriate increase in response? The above Census study in Michigan was conducted cold, while the farm operators responded less frequently after prior notification. Interviewer techniques, the survey subject matter, the domain of interest, sponsorship, and the frequency of interview may all affect response rates.

COVERAGE

Certain populations are more easily reached by telephone than others. This creates a large range in the coverage bias that may occur from telephone data collection. Current literature provides a number of studies that characterize telephone verses nontelephone households, and listed verses nonlisted numbers. These studies have made it easier to identify ahead of time the surveys that can be conducted appropriately using the telephone. The development of RDD techniques have greatly reduced the coverage problems associated with reaching many populations. Dual frame methodology has been used to minimize coverage problems in telephone data collection as well as personal interview surveys. However, more research is needed in the area of using the telephone to contact rare or specialized populations for which good list sources (with telephone numbers) are unavailable.

About ninety-three percent of the households in the U.S. have telephones, but the characteristics of persons without telephones differ from those of persons with telephones in a number of important ways. Some of those identified in the literature (Massey, Marquis and Tortora: 1982) are:

- fewer older persons (45+) are without telephones
- more blacks are without telephones
- persons without telephones have more physician visits per year
- persons without telephones experience more crime victimization
- persons with out telephones have lower incomes and lower levels of education

Of the telephone households in the U.S., there are also differences in the characteristics of people in those households who have listed or unlisted telephone numbers. The head of a household with an unlisted number is more likely to be younger, female, and have a lower income (Glasser and Gale, 1975).

Certain populations can be effectively contacted through list telephone sampling techniques. Random digit dialing techniques have been developed and are widely used in telephone surveys when telephone list sampling is inadequate. Such techniques include those developed by Waksberg (1978), Sudman (1973), and even some procedures that do not result in known probabilities of selection and therefore are not statistically valid.

Dual frame methodology is a primary tool to minimize coverage problems while maintaining efficiency. Random digit dialing techniques are used in conjunction with more economical list sampling procedures to eliminate biases derived from failing to contact the portion of the target population not on the list. Area frames have been combined with more traditional telephone sampling procedures to include the portion of a population without telephones. While this methodology can provide solutions to many coverage problems, a price may be paid. A second frame such as an area frame may be difficult to construct and sample for rare domains. Nonsampling errors generally increase when a second frame is used. Care will have to be taken to ensure that the survey operations are sufficiently controlled so that reduction in coverage bias is not outweighed by possible gains in nonsampling errors.

INTERVIEW MEDIUM BIAS

Under the present state of survey methodology, one should not expect to find massive differences between data collected from a well designed personal interview survey and an equally well designed telephone survey. There can, however, be some differences, and the importance of those differences will depend on the level of accuracy that must be achieved in the estimates and the particular subject matter that is being addressed. Other factors affecting interview medium bias include: 1) comparability of questions (with face-to-face or mail questions), 2) possible interviewer effect, 3) length of interview, and 4) length and complexity of specific questions.

Massey, Marquis and Tortora (1982) note conflicting evidence about interview medium bias. Some studies by the Census Bureau and the Statistical Reporting Service indicate the comparability of face-to-face and telephone interviewing. However, NCHS has found that more of some health events and higher incomes are reported over the telephone. Further research into this area should include validity studies to accurately measure and account for differences that can occur.

Interviewer effect in telephone surveys will need to be addressed carefully by Federal agencies as telephone data collection increases. Many articles indicating the presence or

absence of these effects appear in current literature related to survey methodology. For example, Nealon (1983) found that male interviewers of farm operators and spouses had significantly higher refusals rates, longer interview times and obtained different responses for farm characteristics than their female counterparts. Training will have to continue to be emphasized to minimize the possible effects of interviewer bias. Studies need to be developed to understand these effects on different population and in collecting different types of data.

How long can a telephone interview reasonably be? There is no one answer to this question. Telephone interviews lasting up to twenty or thirty minutes are common and have the potential for reducing data collection costs over personal interviews of similar lengths. One hour telephone interviews have been successfully conducted with certain subpopulations (Dillman, 1978: p. 55). The realistic maximum length of a given interview will depend on such issues as the respondent's perception of the importance of the survey and whether there was some type of previous contact with the respondent. As personal interview cost increase, the advantages of telephone data collection will increase the pressure to do more telephone interviewing. This may require that innovative sampling procedures such as the global-detail approach (where the telephone data collection uses the global questionnaire) be investigated. The length and complexity of individual questions will need to be considered. CATI may help eliminate potential problems with its ability to carry forward answers and make correct branches.

INTERVIEWER MONITORING, TRAINING AND EVALUATION

The perception that greater control of the interview process is possible through centralized interviewing has been a major impetus to the increase in telephone data collection in the survey community. This control stems from the ability to closely monitor interviewers and provide immediate retraining when problems arise. Survey practitioners are exploring different procedures for hiring, training and evaluating interviewers for telephone data collection. Some of these issues are examined below.

Monitoring is a key word in most centralized telephone data collection facilities. Phone systems are designed to allow the supervisor to "listen in" to interviews at any time to observe whether questions are being read verbatim, whether correct skip and branching patterns are followed, and whether proper probing techniques are being used as required during the interview. If an interviewer is having a particular problem, the supervisor can provide immediate feedback to correct the situation. If a problem seems widespread, a supplemental mini-training session can be held for little additional cost and without disrupting the flow of data collection. The development of CATI for telephone interviewing has broadened the ability of supervisors to monitor on-going interviews. Many CATI facilities have CRT monitors for the supervisor which allow the supervisor to see, as well as hear, an interview as it is taking place.

Mathiowetz and Cannell at the University of Michigan have expanded the concept of monitoring for their CATI interview facility. They are developing a set of specific codes to remove some of the subjectivity from monitoring. The codes are organized around the major activities of an interviewer such as question asking, feedback, pacing, etc. While monitoring, the supervisor classifies the interviewers actions as correct or incorrect for each specifically defined activity according to the concepts and specifications of the particular study. These assessments are reviewed with the interviewers as part of a continual feedback procedure.

The qualities that make a good face-to-face interviewer are not always the same as those that make a good telephone interviewer. The Census Bureau provided an analysis of job requirements for telephone interviewers by summarizing the responses from thirteen public and private survey research organizations regarding the criteria that they felt were important in telephone interviewing. The results are presented by Lacey. The purpose of the study is to identify behaviors that would help them in hiring good telephone interviewers. The following behaviors are among those identified most often as critical for potential interviewers to have upon job entry: reads and follows questionnaire directions, follows training instructions conscientiously, records responses accurately, and listens attentively. Other behaviors were identified as important for job success, but were judged more difficult for interviewers to master. It is suggested that these areas be covered extensively in training: converts refusals or abates reluctance, probes neutrally, classifies and codes responses accurately, handles respondents concerns aptly, and controls the interview. The analysis does not show comparisons between these behaviors and those important in face-to-face interviewing.

Interviewer perceptions and training for computer assisted telephone interviewing are discussed by Morton and House. They write that interviewers frequently form strong preferences for CATI over the traditional paper-pencil data collection mode once they overcome any initial reservations about their ability to master the technology. The most important recommendation made in training CATI interviewers is to get them onto terminals as soon as possible so they can begin to gain confidence, and to keep them on the terminals throughout as much of the training as possible.

CATI

CATI, along with RDD, represents the future for telephone interviewing. More effort will be concentrated in this area by the federal survey organizations than in any other type of activity associated with data collection. No other survey methodology has the potential to impact on survey activities like CATI. In fact, it may change the modus operandi of these survey organizations. New skills will have to be acquired, survey operations reordered or modified, and training and perhaps even interviewer hiring changed. However, the potential quality improvements to the data collection procedures and the data itself should justify most changes.

When compared with traditional telephone data collection, CATI surveys have a number of potential advantages. First, improvements in data quality can be obtained in a number of ways, including the use of online edit and consistency checks. These checks can be made between data items on a single questionnaire and against previously reported historic data. Computerized control of questionnaire skips and branches can reduce non-sampling errors in interviews over the telephone. A CATI system can assist supervisors in monitoring interviewers and provide greater consistency in the way questionnaires are administered and the way in which unstructured probing is done. The system can facilitate a reduction in interviewer effects through replication and a reduction in question order bias through randomization techniques. In a second major area of improvement, CATI system can reduce the time required for data collection and processing by eliminating a separate data entry step, facilitating sample management, reducing post-interview editing, and reducing presurvey paper handling. Third, a CATI system will provide more flexibility in questionnaire design because the questions are no longer dictated by paper size and shape. Computerized control of questionnaire skips and branches can facilitate the administration of complicated questionnaires over the telephone. These and other potential advantages of CATI in telephone data collection will mandate its continued increased use in major statistical agencies and organizations.

Groves and others (1980) and later Nicholls (1983) have observed that the limitations in CATI data collection derive from the same characteristics that give it its greatest strengths - control of the data collection procedures. Nicholls says that CATI systems are generally "...less flexible than manual methods which rely on the adaptability and judgement of survey staff to adjust priorities and procedures as knowledge of response rates and field costs accumulate." CATI requires more thorough planning prior to the start of data collection than is typically done in paper-and-pencil methods. Most organizations that have experimented with CATI have observed that this new mode of data collection makes relatively major changes in the structure of the organization. Several hardware options are actively being pursued in the development of CATI. The Census Bureau is using mini-computers for its initial CATI development and testing, while the Statistical Reporting Service (SRS) is developing its CATI system on microcomputers. The University of Wisconsin developed its CATI system on personal computers and to download completed interviews to a mini. Chilton's Research Corporation is interviewing from a large, central mainframe. The choice of hardware depends on the size of the telephone data collection operation and on additional functions that the organization wishes to maintain on the same hardware.

A microcomputer option is presented in more detail. SRS is exploring the maximized use of hardware in its testbed site in the California field office. When the hardware is not being used for interviewing or direct data entry (DDE), it will be used to provide word processing, data base management activities, remote job entry to a large main frame, and statistical analysis. A major part of the test is to determine how well the hardware can handle these various tasks, with and without CATI interviewing or DDE being conducted simultaneously. SRS expects the coordination of hardware and tasks to impact significantly on the field office operation and structure.

The SRS site is configured as follows:

EQUIPMENT	QUANTITY	COST PER	TOTAL COST
Multuser CPU	1	42,000	42,000
Dot Matrix Printer	1	1,200	1,200
CRTS	6	1,400	8,400

The CPU has sixteen ports and can be upgraded to twenty-four. The dot matrix printer will eventually be replaced by a high speed line printer so that the machine can be used for other functions. The CRT's are more sophisticated than is necessary for interviewing or DDE, costing \$600-\$700 more per unit, but were purchased with the other uses of the system in mind. In addition, the system will include a backup CPU (costing about \$20,000), a nine track tape drive, and other pieces of hardware for text processing.

The operation of this CATI facility will demand that personnel assume additional responsibilities. It may require that the office manager become a system manager with the authority to stop personnel from performing certain tasks that slow the data collection. The questionnaire designer will have to have new skills to develop CATI instruments. All members of the staff associated with data collection will have to develop their knowledge of the specific hardware and software that is used.

In summary, CATI represents an advancement in survey methodology that has the potential to greatly enhance telephone data collection but which will bring along with it certain disadvantages which must be dealt with. It will certainly initiate changes in survey organizations that experiment with this new technology. Nicholls concludes his papers by stating that CATI may have its greatest advantages and cost-effectiveness when used for larger, repetitive surveys which are carefully planned and pretested. Its cost effectiveness in smaller efforts is less assured, but experience in private sector data collection suggests that CATI can also be appropriate in many of those situations.

DUAL FRAMES

Dual frame methodology minimizes coverage problems while maintaining efficiency. The addition of several modes of interviewing into a dual frame design may further increase the efficiency of the earlier design, allowing different subsets of a population to be contacted in the most economically realistic manner possible. This combination of dual frame/dual mode data collection is an increasingly popular methodology, and it has allowed telephone interviewing to be used in innovative new designs.

Hartley (1962) developed the theory of multiple or dual frame sampling over twenty years ago. Traditionally this concept combined a list frame with an area frame to ensure complete coverage of the population. A variety of modes of interviewing have been used with these dual frame designs, however initial contacts from an area frame sample are generally completed as personal interviews. The list frame interviews are conducted via mail, telephone, personal interview, or some combination of the three. Some of the more interesting designs currently used by federal agencies involve random digit dialing techniques to generate one of the samples. The second sample may be generated from 1) an area frame with personal enumeration, or 2) a traditional list frame surveyed by telephone.

Lund (1968), Casady and Sirken (1980), and Casady, Snowden and Sirken (1981) have studied the problem of the optimum allocation of samples when at least one frame is contacted by telephone. In these papers the variance of an estimator is minimized for a given sample design. These estimators have reduced sampling errors, compared to single frame estimators. However, nonsampling errors multiply as the number of frames and modes increase. Not only are there the nonsampling errors associated with each frame individually, but additional errors are introduced because of the problems of detecting overlap between the frames.

Massey, Marquis and Tortora note several issues that need to be addressed:

How will the area frame sample represent areas with poor telephone coverage?

How will questionnaires be designed for the different modes of data collection?

Will the overlapping portions of each frame estimate the same population parameters?

Will the total cost for a dual frame design be optimum (in the sense of reducing mean square error) when compared to a single frame survey?

Some recent research has begun to address this last question. Casady and Sirken (1982) examine the impact of nonresponse on the telephone only frame, for the National Health Interview Survey. They conclude that this dual frame design would probably not be

justified unless a response rate of 80 percent was achieved by telephone. Beimer (1983) studies the impact of mean square error on optimum allocation via a simulation study for the Current Population Survey. He concludes that survey bias is the most important factor in allocating a dual frame sample. In particular, a telephone survey bias of 5 percent would result in an allocation of less than 5 percent of the sample to the telephone frame. These results are based on a restricted range of parameters for the dual frame design of the CPS and for national estimates of monthly unemployment rates.

BIBLIOGRAPHY 1/

Biemer, Paul P. 1983. "Optimum Dual Frame Design: Results of a Simulation Study." In the Proceedings of the Section on Survey Research Methods. American Statistical Association.

This paper shows the results of a simulation study of optimization of a dual frame design for the CPS. Some of the issues addressed in the paper are: the importance of nonsampling biases in the decision to adopt a dual frame survey approach; the performance of four estimators; the role of telephone availability, cost, and sampling and nonsampling error components on dual frame allocation decisions.

Cannell, Charles F. 1978. The Telephone Interview: Progress and Prospects. Ann Arbor: Univ. of Michigan, Survey Research Center.

The purpose of this paper is to introduce and discuss briefly some of the issues relating to telephone interviewing. Topics included are: personal versus telephone interviewing, response validity, interviewer technique, monitoring interviewer performance, sampling, response rates, cost, and computer-assisted interviewing by telephone.

Casady, Robert J., and Monroe G. Sirken. 1980. "A Multiplicity Estimator for Multiple Frame Sampling." In the Proceedings of the Section on Survey Research Methods. Washington, D.C.: American Statistical Association.

The purpose of this paper is two-fold. First, the definitions and notations which have been utilized in the literature to develop the theory and methods of multiple frame sampling and network sampling are consolidated and unified. Secondly, the multiple frame estimator produced by Hartley is extended to include the situation in which the data for at least one of the sampling frames is collected via a multiplicity counting rule. This generalized Hartley estimator is analytically compared to the stratified sampling multiplicity estimator proposed by Sirken.

Casady, Robert J., Cecelia B. Snowden and Monroe G. Sirken. 1981. "A Study of Dual Frame Estimators for the National Health Interview Survey." In the Proceedings of the Section on Survey Research Methods. Washington, D.C.: American Statistical Association.

This paper discusses a dual frame design for the National Health Interview Survey. The preliminary findings show that a dual frame NHIS would have smaller sampling errors.

Colombotos, John. 1969. "Personal versus telephone interviews effect on responses." Public Health Reports, Vol. 84, No. 9, September, p. 773-782.

The purpose of this study was to compare responses in two types of surveys--telephone and personal interviewing--to questions to which the respondents (physicians) may give answers that are consciously or unconsciously distorted or biased in the direction of social desirability or prestige enhancement. There are essentially no differences between the responses of physicians interviewed in person and those interviewed by telephone.

Curtin, Richard T. 1982. "Indicators of Consumer Behavior." Public Opinion Quarterly. Vol. 46, p. 340-352.

Dillman, Don A. 1978. Mail and Telephone Surveys: The Total Design Method. New York: John Wiley.

This monograph covers several topics of interest on telephone interviewing. The advantages and disadvantages of mail, telephone, and personal surveys are discussed in terms of response, refusal, and completion rates, sampling, cost, etc. Chapters dealing with question writing, principles, constructing telephone questionnaires, and implementing telephone surveys are very informative.

Dillman, Don A., Jean G. Gallegos, and James H. Frey. 1976. "Reducing Refusal Rates for Telephone Interviews." Public Opinion Quarterly, Vol. 40, No. 1, Spring, p. 66-78.

In two experiments, refusal rates to telephone interviews were not affected by substantial changes in the introductory remarks of the interviewer. A prior letter significantly lowered refusal rates in a third experiment. In all three, interviewer sex had no effect. Implications for choosing random digit dialing or telephone directories for sampling are briefly discussed.

Freeman, John and Edgar W. Butler. 1976. "Some Sources of Interviewer Variance in Surveys," Public Opinion Quarterly, Vol 40, Spring, pp 79-91.

Interviewer variance is examined for 33 interviewers and 3,000 interviews, with age, sex, socioeconomic status, social mobility, and interviewer ratings as key variables. It differs among interview schedule items and is influenced by combinations of sex and age of interviewers and respondents. Selecting interviewers and assigning households-respondents to them is a complex process, and matching interviewers with respondents on "face sheet" characteristics may produce error in some instances while reducing error in others.

Glasser, Gerald J. and Gale D. Metzger. 1975. "National estimates of non-listed telephone households and their characteristics." Journal of Marketing Research, Vol. 12, August, p. 359-361.

A telephone household may be unlisted because the household asked not to be listed or because the household has moved too recently into an area to be included in the directory. Random digit dialing has received attention as a methodology capable of including unlisted telephone households. To assess the adequacy of telephone directories as a frame for sampling, or in estimating the bias from the use of such a frame, or in deciding whether to use random digit dialing, it is important to have some idea of the characteristics of non-listed telephone households. This article updates and expands on results based on a March 1970 study and subsequent annual surveys through 1974.

Groves, Robert M. 1977. "An Experimental Comparison of National Telephone and Personal Interview Surveys." In the Proceedings of the Social Statistics Section. Washington, D. C.: American Statistical Association.

This paper reports a comparison of telephone and personal interview surveys which attempted to collect the same information from national samples of adults. The discussion summarizes a large group of analyses on the data and compares the two

designs on their coverage of the U.S. household population, achieved response rates, ease of obtaining interviews, demographic characteristics of respondents, differences in responses on identical questions, estimates of sampling and interviewer variance, and costs of the data collection.

Groves, Robert M. 1979. "Actors and questions in telephone and personal interview surveys." Public Opinion Quarterly, Vol. 43, No. 2, Summer, p. 190-205.

This paper concentrates on two aspects of telephone survey administration: (1) the respondent's reactions to the request for an interview and to the interview itself, and (2) the properties of questions using response cards in personal interviews and adaptations of these questions for telephone use.

Groves, Robert M. 1978. "An Empirical Comparison of Two Telephone Sample Designs." Journal of Marketing Research, Vol 15, pp 622-631.

The clustered telephone sample design described by Waksberg is compared with a design randomly generating four digit numbers within working prefixes. The clustered sample is found to increase the proportion of working household numbers selected from about 22% to over 55%, but sampling errors and design effects of the two sample designs show some loss of precision in the clustered design. A cost-variance model is constructed which provides estimates of desirable cluster sizes given varying amounts of intracluster homogeneity.

Groves, Robert M. and James M. Lepkowski. 1982. "Alternative Dual Frame Mixed Mode Survey Designs." In the Proceedings of the Section on Survey Research Methods. Washington, D.C.: American Statistical Association.

This paper reviews and explores the cost and allocation issues of designing dual frame, mixed mode surveys. Two estimators for dual frame designs are reviewed in section 2, and alternative administrative structures are explored in subsequent sections.

Groves, Robert M. and Robert L. Kahn. 1979. Surveys by Telephone: A National Comparison with Personal Interviews. New York: Academic Press.

This book compares telephone and personal interviews of household populations with respect to administrative arrangements, costs, and components of error. These comparison is based on continuing nation wide personal and telephone interview studies at the University of Michigan Survey Research Center.

Groves, Robert M., Marianne Berry and Nancy Mathiowetz. 1980. "Some Impacts of Computer Assisted Telephone Interviewing on Survey Methods." In the Proceedings of the Section on Survey Research Methods. Washington, D.C.: American Statistical Association.

This paper discusses some problems encountered making the transition from paper questionnaire survey administration to computer-based interviewing. The focus is on two aspects of CATI which have proven to have some unforeseen consequences: segmentation --the limitation of one's ability to examine the survey instrument as a whole; and the standardization of survey activities which an on-line system compels.

Hartley, H.O. 1962. "Multiple Frame Surveys." In the Proceedings of the Social Science Section. Washington, D.C.: American Statistical Association.

The classic article on the development of multiple frame methodology.

Hauck, Mathew and Michael Cox. 1974. "Locating a Sample by Random Digit Dialing," Public Opinion Quarterly, Vol 38, No 2, Summer, pp 253-260.

This article describes a study in which random digit dialing was successfully in screening to obtain household information necessary to select a special sample. There was a savings in cost of screening in person.

Herman, Jeanne B. 1977. "Mixed Mode Data Collection: Telephone and Personal Interviewing," Journal of Applied Psychology, Vol 62, pp 399-404.

The utility of mixed-mode telephone interview/personal interview method of data collection was examined in a study of voting in union representation elections. The sample of 1,239 employees in 31 different elections was heterogeneous with respect to age, education level, sex, race wage rate, and urban-rural background. The utility of the mixed-mode (telephone with personal follow-up) was evaluated with respect to (a) response rate, (b) cost, and (c) quality.

Hochstim, Joseph R. 1967. "A Critical Comparison of Three Strategies of Collecting Data from Households," Journal of the American Statistical Association, Vol 62, Issue 319, Sept., pp 976-989.

Returns and findings from three strategies of data collection are compared. Each strategy contains personal interviews, telephone interviews, and mail questionnaires in different combinations--one mainly personal, one mainly telephone, and one mainly mail. All three strategies are based on area probability sample of households in Alameda County, California. The test was made on two separate studies, with identical questionnaires used in all strategies within each study. The responses from the three strategies were found to be highly comparable. Rate of return and rate of completeness of questionnaires were high for all three; substantive findings were virtually interchangeable, and there was little difference in validity. The only important difference was cost per interview which varied considerably by strategy.

House, Carol C. and Betsy T. Morton. 1983. "Measuring CATI Effects on Numerical Data." In the Proceedings of the Section on Survey Research Methods. Washington, D.C.: American Statistical Association

This reports summarizes the results of a two phase study comparing CATI versus non-CATI telephone interviews to collect cattle inventory data in California. The analysis examines differences in the levels of estimates of various subgroup totals and measures relative data quality by examining the results from standard edit programs.

Klecka, William R. and Alfred J. Tuchfarber, Jr. 1974. The Efficiency, Biases, and Problems of Random Digit Dialing. Cincinnati: Univ. of Cincinnati, Behavioral Sciences Laboratory.

This paper seeks to demonstrate that in a carefully designed study with proper operating procedures, random digit dialing is an extremely efficient, inexpensive,

and generally unbiased alternative to most face-to-face interviewing applications. A comment on potential problems (including sample bias) of random digit dialing is included.

Lacey, Barbara H. 1982. "Random Digit Dialing Experiments: An Analysis of Job Requirements for Telephone Interviewers." Presented at the Fourth Conference on Health Survey Research Methods, Washington, D.C., May.

This analysis involves a job requirements survey of thirteen survey organizations who provided information on issues such as the nature of the work performed by telephone interviewers, and the importance of various work behaviors. On the basis of this information, selection procedures were developed to predict trainability, predict job performance and to provide opportunity for applicant self-screening

Landon, E. Laird, Jr. and Sharon K. Banks. 1977. "Relative Efficiency of Bias of Plus-One Telephone Sampling." Journal of Marketing Research, Vol. XIV, August, p. 294-299.

The Plus-one telephone sampling method is discussed and evaluated. The primary criteria of evaluation are efficiency and bias. Plus-one is compared with previously published sampling methods and evaluated through an analysis of empirical studies.

Locander, William, Seymour Sudman and Norman Bradburn. 1974. "An investigation of interview method, threat, and response distortion." In the Proceedings of the Social Statistics Section, 17th Annual Edition. Washington, D.C.: American Statistical Association, p. 21-27.

The purpose of this study was to examine the joint effects of question threat and method of administration on response distortion. Another major objective was to study the randomized response model which has been described as a technique to reduce or completely eliminate response distortion of threatening or personal questions. Four interview techniques are compared: face-to-face, telephone, self-administered, and the random response model. Completion rates are reported. It was found that no data collection method is superior to all other methods for all types of threatening questions.

Lucas, William A., and William C. Adams. 1977. The Rand Corporation. An Assessment of Telephone Survey Methods. Santa Monica, Ca.: Rand, October.

This report documents a methodological study conducted for NSF, and serves two purposes. It establishes the reliability of the data collected in the Rand investigation of the effects of local media, and documents the procedures. It also contributes to a general understanding of the strengths and weaknesses of telephone surveys for studying political and communications behavior. Findings conclude telephone surveys can provide representative sample of the general population, and can obtain reliable answers on sensitive topics.

Lund, R. 1968. "Estimators in Multiple Frame Surveys." In the Proceedings of the Social Statistics Section. Washington, D.C.: American Statistical Association.

Massey, James T., Peggy R. Barker, and Sue Hsiung. 1981. "An Investigation of Response in a Telephone Survey." In the Proceedings of the Survey Methods Section. Washington, D.C.: American Statistical Association.

The purpose of this paper is to take a in-depth look at the response rates achieved in a telephone survey in order to better understand the various reasons for nonresponse and to evaluate its impact on the survey results. The results reported in this paper represent the findings from a random digit dialed telephone survey on cigarette smoking conducted by NCHS during 1979.

Massey, James T., Kent H. Marquis, and Robert D. Tortora. 1982. "Methodological Issues Related to Telephone Surveys by Federal Agencies." In the Proceedings of the Social Statistics Section. Washington, D.C.: American Statistical Association.

The purpose of this paper is to discuss the major methodological issues related to telephone interviewing and to describe how three agencies, who have been exchanging information about their telephone survey activities over the past several years, plan to address these issues. The three agencies are the National Center for Health Statistics, the Bureau of the Census, and the Statistical Reporting Service of the Department of Agriculture.

Mathiowetz, Nancy A. and Charles F. Cannell. 1980. "Coding Interviewer Behavior as a Method of Evaluating Performance." In the Proceedings of the Section on Survey Research Methods. Washington, D.C.: American Statistical Association.

This paper discusses a technique for systematically evaluating telephone interviewers based on coding their behavior. Results of the initial application are presented. The coding system has three purposes: trains novices what interviewing techniques are acceptable and which are not; serves as a basis for interviewers and supervisors to review work; and provides an assessment of an interviewer's performance.

Monsees, Marie L. and James T. Massey. Adapting Procedures for Collecting Demographic Data in a Personal Interview to a Telephone Interview. Washington, D.C.: National Center for Health Statistics.

Reporting that telephone surveys may not be appropriate when a flashcard, complex question, or a lengthy interview is required. This paper, in addressing some of these issues, includes: 1) a comparison of socio-demographic characteristics obtained through random digit dialing and a personal interview survey, (2) a comparison of several respondent rules and question formats for collecting family income, and (3) a discussion of the applicability of personal survey household composition questions for a telephone survey.

Morton, Betsy T. and Carol C. House. 1983. "Training Interviewers for Computer Assisted Telephone Interviewing." In the Proceedings of the Section on Survey Research Methods. Washington, D.C.: American Statistical Association.

This paper discusses the techniques used by two survey organizations to train CATI interviewers. It also discusses interviewers concerns about and acceptance of this new technology.

Nealon, Jack. 1983. The Effects of Male vs. Female Telephone Interviewers. Statistical Research Division Staff Paper Number AGES830617. Washington, D. C.: U. S. Department of Agriculture, Statistical Reporting Service, June.

The effects of male vs. female telephone interviewers on the the nonresponse rate, the length of the interview and the responses from 473 farm operators and their spouses were examined using data from the 1980 Farm Women's Survey. The analysis showed that the refusal rate, interview length and many of the responses were significantly affected by whether the telephone interviewer was male or female.

Nelson, Raymond D. 1977. The McMillan System of Random Digit Dialing as Used by Chilton Research Services. Presented to the Washington Statistical Society, Washington, D.C., March, Chilton Research Services.

Describes a system in which probability sample of telephone households are selected through random digit dialing, and how this methodology is enhanced by the use of on-line, interactive survey processor system with cathode ray tube terminals.

Nicholls, William L., II. 1978. "Experiences with CATI in a Large-Scale Survey." Presented at the American Statistical Association Meetings. San Diego, California, August.

This paper presents the experience of the California Disability Survey with the CATI system developed by UCLA's Institute for Social Sciences Research. This survey represents the first large-scale test of the UCLA-CATI system and illustrates many of its strengths as well as its disadvantages. Although not a controlled comparison of CATI with other survey methods, the paper discusses such issues as respondent acceptance of CATI and costs.

Nicholls, William L. II. 1983. "Development of CATI at the U.S. Census Bureau." In the Proceedings of the Section on Survey Research Methods. Washington, D.C.: American Statistical Association.

This paper discusses the effort at the Census Bureau to develop, test, and implement CATI for the Bureau's data collection activities. It reviews the capabilities and potential benefits of CATI, summarizes the Bureau's progress, describes unusual priorities and special requirements of CATI system design for Bureau applications, and examines cost considerations and limitations.

O'Neil, Michael J. 1979. "Estimating the nonresponse bias due to refusals in telephone surveys." Public Opinion Quarterly, Vol. 43, No. 2, Summer, p. 218-232.

This paper attempts to aid the process of accumulating the necessary information for making more informed judgments about the effects of nonresponse under different conditions. Two measures, which permit quantifiable nonsubjective assessment of the effects of nonresponse on sample estimates, are introduced and are used to examine the respondent refusals in a random digit dialed general population telephone survey of over 1,200 households as the response rate is increased from 74.5 percent to 86.8 percent. By applying these measures under a wide range of conditions, the adequacy of various response rates may be assessed and more rational decisions made about the costs and benefits of devoting extraordinary resources to minimizing nonresponse.

O'Neil, Michael J., Robert M. Groves, and Charles F. Cannell. 1979. Telephone Interview Introductions and Refusal Rates: Experiments in Increasing Respondent Cooperation. Presented at the annual meeting of the American Statistical Association, Washington, D.C. August 13-16.

This paper reports on an investigation of one means of reducing nonresponse in telephone surveys. A large proportion of refusals in telephone interviews occur in the first few minutes of the interaction. Consequently, any attempt to reduce refusal rates should carefully consider the nature of the interviewer's introductory remarks. These are the focus of this investigation.

Palit, Charles. 1980. "The Wisconsin Survey Research Laboratory's Computer Assisted Telephone Interviewing System." In the Proceedings of the Survey Research Methods Section. Washington, D. C.: American Statistical Association.

The organization and logistics of a simple microcomputer based CATI system is presented. A brief discussion of some special advantages and disadvantages will be included. Major advantages are the relative ease with which new stations can be added to the system.

Rich, Clyde L. 1977. "Is Random Digit Dialing Really Necessary?" Journal of Marketing Research, Vol. XIV, August, p. 300-305.

The purpose of this article is to suggest that, for some studies, sample which include only published numbers may be adequate. The paper presents characteristics of listed versus non-listed telephone customers obtain from a mail survey conducted by the Pacific Telephone Company in California and by AT&T throughout the Bell System.

Rustemeyer, Anita, Gerald H. Shure, Miles S. Rogers, and Robert J. Meeker. 1978. "Computer-Assisted Telephone Interviewing: Design Considerations." Presented at the American Statistical Association Meetings, San Diego, California, August.

This paper discusses issues concerning what a CATI system should provide, what its parameters should be, and what the effects of the system might be.

Sebestik, Jutta P. and Seymour Sudman. 1977. What Makes a Good Telephone Interviewer? Urbana-Champaign: Univ of Illinois, Survey Research Laboratory, May. Prepared for presentation at the Annual Conference of the American Association for Public Opinion Research, May 1977.

The rapid growth in the use of phone methods in survey research has led to extensive research on telephone sampling procedures and some research on telephone questionnaires. However, little has been done to determine the characteristics that predict success as a telephone interviewer. This paper reports on the characteristics of good telephone and face-to-face interviewers working for the Survey Research Laboratory.

Sirken, Monroe G. and Robert J. Casady. 1982. "Nonresponse in Dual Frame Surveys Based on Area/List and Telephone Frames." In the Proceedings of the Section on Survey Research Methods. Washington, D.C.: American Statistical Association.

This paper discusses research on a dual frame redesign of the National Health Interview Survey. It extends earlier work by adding a fourth factor, frame differentials in nonresponse rates, into the allocation procedures.

Steeh, Charlotte. 1981. "Trends in Nonresponse Rates, 1952-1979." In the Public Opinion Quarterly. Vol. 45, p. 40-57.

Sudman, Seymour. 1967. Reducing the Cost of Surveys. Chicago: Aldine Publishing.

This book includes the description of some additional uses of telephone that have proved successful in NORC studies and have reduced survey costs without affecting quality. The experiments described give examples of value of telephone methods in the interviewing process. In none of these experiments was there any indication that the telephone results were less satisfactory than those obtained from personal interviews. The author states however, that the telephone is not always appropriate for survey interviewing. For example, where the study design requires the respondent to be presented with cards to read or other visual aids, personal interviewing may be necessary.

Sudman, Seyour. 1973. "The Uses of Telephone Directories for Survey Sampling." Journal of Marketing Research, Vol. 10, No. 2, May, p. 204-207.

Discusses methods for combining directory sampling with random digit dialing and some door-to-door listing to obtain various levels of sample quality. Surprisingly, some of the methods that use directories are not only higher in quality, but less expensive than methods that use random dialing or door-to-door listing, exclusively.

Sudman, Seymour and Ferber, Robert. 1974. "A Comparison of Alternative Procedures for Collecting Consumer Expenditure Data for Frequently Purchased Products." Journal of Marketing Research, Vol. XI (May), : 128-135.

This pilot study on alternative means of obtaining consumer expenditure data finds that compensation clearly increased both the level of cooperation and expenditure reported, that government versus university auspices does not make much difference, and that diaries seem to yield more complete and accurate information than telephone procedures, although the latter approach may be very useful for supplementary purposes.

Tremblay, K. R. and Don Dillman. 1977. "Research Ethics: Emerging Concerns from the Increased Use of Mail and Telephone Survey Methods." Humboldt Journal of Social Relations, F/W 1977.

This paper discusses the ethical implications of the increased usage of mail and telephone survey research methods. The ethical issues are twofold: 1) those that are inherent in the nature of the methods, and 2) those that are a result of the conditions under which the surveys are implemented. The purpose of the paper is to sensitize the reader to some of these issues and to suggest their implications for future survey research practices.

Tuchfarber, Alfred J., Jr. and William R. Klecka. 1976. Random Digit Dialing: Lowering the Cost of Victimization Surveys. Washington, D.C.: Police Foundation.

Random digit dialing is a simple telephone survey technique that has proved to be an efficient, accurate, and highly cost effective method for measuring crime victimization. This book describes a field test of the RDD survey method carried out in Cincinnati, Ohio, in April 1974, to measure crime victimization. It compares the field test results with those produced by a personal interview survey

using the same questionnaire in the same city two months earlier. This book then describes in detail how to use RDD.

Tull, Donald S. and Gerald S. Albaum. 1977. "Bias in Random Digit Dialed Surveys," Public Opinion Quarterly, Vol. 41, No. 3, Fall, pp 389-395.

Values for selected demographic and housing characteristics and for the ownership of a number of durable products are estimated from a simulated RDD survey using Census of Population data. Similar estimates are shown for households with no telephone available. Chisquare values are calculated for the two estimates for each of the demographic housing and ownership characteristics considered.

Waksberg, Joseph. 1978. "Sampling methods for Random Digit Dialing." Journal of the American Statistical Association, Vol. 73, No. 361, March, p. 40-46.

A method of sample selection for household telephone interviewing via random digit dialing is developed which significantly reduces the cost of such surveys as compared to dialing numbers completely at random. The sampling is carried out through a two-stage design and has the unusual feature that although all units have the same probability of selection, it is not necessary to know the probabilities of selection of the firststage or the second-stage units. Simple random sampling of possible telephone numbers, within existing telephone exchanges, is inefficient because only about 20 percent of these numbers are actually telephone numbers assigned to households. The method of selection proposed reduces the proportion of unused numbers sharply.

Weaver, Charles N., Sandra L. Holmes, and Norval D. Glenn. 1975. "Some Characteristics of Inaccessible Respondents in a Telephone Survey." Journal of Applied Psychology, Vol. 60, No. 2, p. 260-262.

Characteristics of inaccessible respondents in a telephone survey were investigated. Refusal rates were examined across ethnicity, salary, and age with the highest rate occurring for the oldest age group. Overall percentage of refusals and pattern of refusals by age were similar to those of face-to-face surveys. An analysis of inaccessible black respondents indicated an unusually high inaccessibility rate. Neither refusals nor inaccessibility resulted in large differences between the distributions of persons contacted and persons interviewed. Thus, the chance of bias in the survey responses seems minimal.

Wolfle, Lee M. 1979. "Characteristics of Persons With and Without Home Telephones." Journal of Marketing Research, Vol. XVI, August, p. 421-425.

This study was done to ascertain whether there are any important differences between telephone subscribers and nonsubscribers. From a combination of NORC surveys, analysis of more than 7500 respondents shows that, in most cases, less than 2 % of the responses on a single item of a telephone sample will differ from equivalent responses of a sample of the total population.

U. S. Bureau of the Census. 1965. "Characteristics of Households with Telephones, March 1965, Current Population Reports, Series p-20 No. 146, December 27, 1965.

Special tabulation of data on telephone availability for March 1965.

U. S. Bureau of the Census. 1973. Who's Home When. Prepared by Dean Weber, Working paper 37. Washington, D.C.: GPO, January.

This report contains information about the time of day when people of various characteristics can be found at home. It is useful for planning interviewer calls to various subpopulations. Suggests that maximum use of telephone for making appointments and that the telephone number should be obtained if possible at the time of the first unsuccessful personal visit.

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